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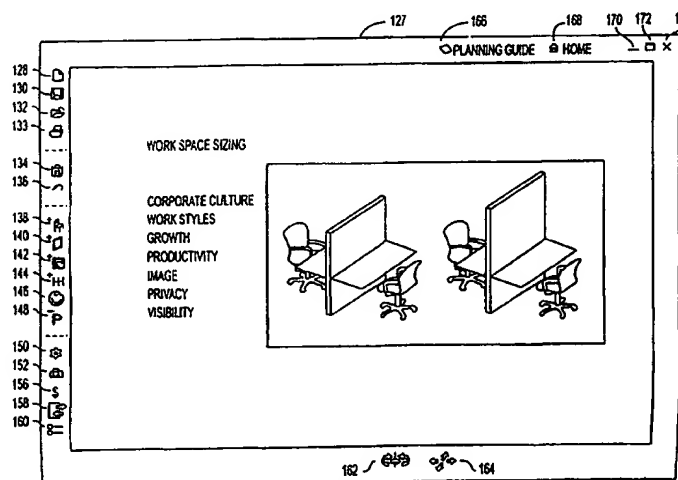
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁶ : G06F 17/50, G06T 17/40, G06F 17/60</p>	<p>A1</p>	<p>(11) International Publication Number: WO 98/55949 (43) International Publication Date: 10 December 1998 (10.12.98)</p>
<p>(21) International Application Number: PCT/US98/09890 (22) International Filing Date: 20 May 1998 (20.05.98) (30) Priority Data: 08/870,681 6 June 1997 (06.06.97) US (71) Applicant (for all designated States except US): HAWORTH, INC. [US/US]; One Haworth Center, Holland, MI 49423-9576 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): SMITH, Ward, W. [US/US]; 911 West Cavanaugh #10, Lansing, MI 48910 (US). ELLIS, John, M. [US/US]; 99 Sunrise Drive, Holland, MI 49423 (US). McNUTT, Michael, P. [US/US]; 1355 Union N.E., Grand Rapids, MI 49505 (US). SCHOEPPPE, Renee, E. [US/US]; 2450 Chassell S.W., Wyoming, MI 49509 (US). (74) Agents: LAZAR, Dale, S. et al.; Cushman Darby & Cushman, Intellectual Property Group of Pillsbury Madison & Sutro, 1100 New York Avenue, N.W., Washington, DC 20005 (US).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report.</p>

(54) Title: GRAPHICAL USER INTERFACE SUPPORTING METHOD AND SYSTEM FOR REMOTE ORDER GENERATION OF OFFICE FURNITURE PRODUCTS



(57) Abstract

A graphical user interface to a method and system for configuring office furniture includes interface objects for obtaining configuration criteria from a user; presenting the user with at least one typical configuration satisfying the criteria; selecting a typical configuration from the at least one typical configuration; modifying aspects of the selected typical configuration to produce a modified configuration; and checking the validity of the modified configuration. The configuration criteria include conferencing criteria; privacy criteria; power criteria; communications criteria; storage criteria; and area criteria. A typical configuration can be modified by adding, deleting, or repositioning a component, changing the fabric or finish or the shape or size of the component. A cluster configuration based on the typical configuration is formed. The entire product line can be changed. At any time the entire typical or cluster configuration can be checked for validity and priced.

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GRAPHICAL USER INTERFACE
SUPPORTING METHOD AND SYSTEM FOR REMOTE ORDER
GENERATION OF OFFICE FURNITURE PRODUCTS

5

BACKGROUND OF THE INVENTION

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2. Field of Invention

This invention relates to graphical user interface supporting a method and system for enabling the selection and configuration of complex furniture products. More specifically, this invention relates to enabling the selection and configuration of three-dimensional office furnishing products so as to enable remote order generation of valid and acceptable configurations of those products.

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3. Description of Background Information

The sale process for complex products, that is, products that are made up of many interconnected parts, is notoriously difficult, especially when customers are given configuration and product-line choices.

For example, in the office furniture industry, the goal of the sale process is to provide the customer with an acceptable furniture configuration within the customer's price limitations.

From the customer's perspective, an acceptable configuration is one which will provide workspace for their employees within various work-related and space criteria set by the customer. For example, a customer may need to provide, in a given area, sitting work space for a thousand people, where all people have acoustic privacy. A customer's criteria may be complex and often the customer does not really know what they are, other than to know the number of people and the space they will go into.

From the manufacturer's perspective, an acceptable configuration is one which can be manufactured from the manufacturer's product line. That is, an acceptable configuration is a valid, manufacturable configuration of existing component parts.

The sales process is essentially an attempt to reach a convergence on a configuration which is

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acceptable to the customer (meets all space, price and other requirements) and which is acceptable to the manufacturer (is a valid configuration which is manufacturable).

5 An office workspace configuration may comprise thousands of parts drawn from an inventory of millions of possible parts. Each workspace may comprise dividing walls or side panels, work surfaces, storage areas, support structure, electrical structure and the
10 like. Even for a given configuration of workspace, there are various qualitative and quantitative options available. Each part may be available in various qualities and in various colors. Some of the parts may not be compatible with parts from other product lines
15 of the same or other manufacturers. Further, any choice made, even for a single part, may affect the entire configuration.

 A customer wishing to buy a complex product such as office furniture is faced with an incredible number
20 of interdependent choices.

 In the office furniture market at present, a typical sale takes place as follows: A salesperson visits a customer and presents the customer with drawings of some typical configurations of various
25 product lines. The customer selects various options which the salesperson records. At this time all of the

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sale is taking place in terms of individual parts and not in terms of the final product or even in terms of compound components of the final product. In other words, the customer does not buy a collection of
5 workstations, instead he buys a collection of parts.

Once the customer is satisfied with the configuration, the salesperson goes back to the manufacturer who determines whether or not the configuration is actually possible given the current
10 product line. For example, the customer may have put a shelf on a dividing panel without confirming that the panel could actually support such a shelf. Or a panel may be given a size which the manufacturer does not or cannot manufacture. Accordingly, the manufacturer then
15 tries to build the customer's proposed order using a CAD (computer aided design) system and a collection of known parts. Errors in the customer's proposed order are reported and, in some cases, a best attempt at the order is drawn up. From this best attempt produced by
20 the CAD operators, a list of required component parts is obtained and then a price for the entire configuration is determined for all of the component parts.

This process, so far, can take more than two
25 weeks. The sales person then goes back to the customer with the design, as best it could be done, and the

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price for this design. This is the first time that the customer sees his actual order drawn out, and usually in two-dimensions. If there were errors in the design, which there usually are, or if the customer does not
5 like the current design, the process is repeated.

After some number of iterations (that is customer to sales person to CAD operator to pricing and back to the customer via the sales person), the customer is finally presented with an acceptable configuration and
10 a price for that configuration.

In a typical sales scenario this whole order process (i.e., convergence to a configuration which is acceptable to both the customer and the manufacturer) takes six sales calls and design iterations.

15 Even when the customer is satisfied with a configuration and even if it is a valid, manufacturable configuration, there is no simple way for anyone to go back and ask a simple "what if" type of question about the order. For instance, if, in an order for an
20 acceptable configuration, the customer wants to know the effect on price of changing to a different quality panel system, the whole price would have to be redetermined by the manufacturer.

To see why this pricing and configuration process
25 is not simple, consider the change from a high quality panel to a lower quality panel of the otherwise same

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dimensions. Suppose that the panel has a shelf hanging on it and that the high quality panel can support shelves whereas the lower quality panel cannot support shelves without an extra support. So, a supposedly
5 simple question like "What if I use this type of panel instead of that?" can lead to an entire reconfiguration and repricing of the system. Its often not enough to just change the price of the components being used, sometimes the components themselves have to be
10 supplemented. In some cases, changes may not be possible.

Even from a salesperson's perspective, the inability to price "what if" scenarios has major drawbacks. For instance, if a customer is satisfied
15 with a configuration's layout but still thinks that the price is too high, it is desirable for the salesperson to be able to make qualitative changes to the configuration and show what the corresponding price changes would be. In the case of office furnishings, a
20 salesperson would like to be able to show, at the customer's site and at the time of setting up the configuration, the effects on price of various changes. In that way, convergence to an acceptable configuration can be achieved with greater speed.

25 In the general field of product configuration, tools have been developed to aid in selection and

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validation of configurations. One such system is available from Trilogy Development Group of Austin, Texas, and is described in United States Patent No. 5,515,524, "Method and Apparatus for Configuring
5 Systems," to Lynch et al, which is expressly incorporated herein by reference in its entirety.

Lynch describes a constraint based configuration system using a structural model hierarchy. The structural aspects of the model provide the system with
10 the ability to define a model element as being contained in, or by, another model element. The structural model provides the ability to identify logical datatype and physical interconnections between elements and to establish connections between elements.

15 In order to configure a product, Lynch's system accepts input in the form of requests or needs. Using this information, Lynch's system configures a system by identifying the resource and component needs, constraints imposed on or by the resources or
20 components identified, and the structural aspects of the system.

In the specific area of office furniture configuration, attempts have been made to provide customers with simple CAD systems with which to design
25 their configurations. The problems with these systems include that they are difficult to use, they are

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inaccurate, they do not provide the customer with a way to determine whether or not he has a valid, manufacturable configuration (so the customer still has to go back to the manufacturer to have configurations manually checked), and they do not have any knowledge of the manufacturer's product line. Further, no proposed systems are able to prepare a configuration and provide a price for that configuration.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an order generation system, preferably a remote order generation system.

It is a further object of this invention to provide sales people and customers with product configuration systems that are easy to use, accurate, provide the customer with some way to determine whether or not he has a valid, manufacturable configuration (so that the customer does not have to go back to the manufacturer to have configurations checked each time they change), and that has knowledge of the manufacturer's product line. It is a further object of this invention to provide a system that is able to prepare a configuration and that is also able to provide a price for that configuration.

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It is also an object of this invention to provide a system that can have product line and price information added and modified.

5 It is also an object of this invention to provide a system that generates visual specification in two-dimensional (2-D) and three-dimensional (3-D) rendered images.

Accordingly, in one aspect, this invention provides a graphical user interface to a computer
10 program for configuring and ordering office furniture. The user interface presents a user with various selectable options, via display screens on a monitor. Depending upon which options the user selects, the graphical user interface provides the user with
15 information about the product selected or gets input from the user about his requirements.

The user can interact with the order generation program via the user interface to select a basic configuration of furniture, modify the configuration,
20 create a cluster derived from the basic configuration. At all times the user is able to ensure that the current configuration is valid (i.e., manufacturable and/or within the product line) and the user is able to obtain price information about the configuration.

25 The system takes as input user criteria such as conferencing criteria; privacy criteria; power

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criteria; communications criteria; storage criteria;
and area criteria.

5 The user, via the user interface, can modify a
configuration by adding, deleting or moving components
in the configuration or by changing the size or shape
of a component of the configuration. When the shape or
size of a component is adjusted, it can only be changed
to a valid shape or size, thereby maintaining the
integrity of the displayed furniture configuration.

10 Generally, at any stage of the furniture
configuration, the user is able to obtain a realistic
display of the configuration and is then able to view
that display from arbitrary view points.

15 Thus, in one aspect, this invention is a graphical
user interface, a method for using the graphical user
interface, or a method of configuring office furniture.
In another aspect, this invention is computer-readable
media tangibly embodying an interface program of
instructions executable by the machine to provide a
20 graphical user interface to a computer program for
configuring office furniture.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The above and other objects, features, and
advantages of the present invention are further
described in the detailed description which follows,

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with reference to the drawings by way of non-limiting exemplary embodiments of the present invention, wherein like reference numerals represent similar parts of the present invention throughout the several views and

5 wherein:

FIGURE 1 depicts a typical computer system on which the order generator of this invention operates;

FIGURE 2 shows the architecture of a preferred embodiment of the order generator according to this
10 invention;

FIGURE 3 shows the architecture of an alternative preferred embodiment of the order generator according to this invention;

FIGURE 4 is a flowchart of the operation, from a
15 user's perspective, of the order generator of the present invention; and

FIGURES 5-15 depict various interface displays of the order generator of the present invention during its operation.

20

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EXEMPLARY EMBODIMENTS

This invention operates on a typical computer system 100 such as shown in FIGURE 1. The computer
25 system 100 includes various input devices 102 such as a keyboard, as well as a pointer device 104. A mouse,

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track ball, touch screen, keyboard cursor control keys or the like can be employed as the pointer device 104. The computer system 100 also includes a processor such as CPU 106 and internal memory 108. The processor 106
5 may be a special purpose processor with image processing capabilities or it may be a general purpose processor. The memory 108 may comprise various types of memory, including RAM, ROM, and the like. The computer system 100 also includes external storage 112
10 which includes devices such as disks, CD ROMs, ASICs, external RAM, external ROM and the like.

The present invention can be implemented as part of the processor 106 or as a program residing in memory 108 (and external storage 112) and running on processor
15 106, or as a combination of program and specialized hardware. When in memory 108 and/or external storage 112, the program can be in a RAM, a ROM, an internal or external disk, a CD ROM, an ASIC or the like. In general, when implemented as a program or in part as a
20 program, the program can be encoded on any computer-readable medium or combination of computer-readable media, including but not limited to a RAM, a ROM, a disk, an ASIC, a PROM and the like.

The computer system 100 also includes a display
25 110 and, optionally, an output device such as a printer 113.

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The computer system 100 can run any operating system.

In preferred embodiments, the computer system 100 is an IBM PC compatible notebook computer configured with a Pentium 90 (or above) CPU (for processor 106) and, (for memory 108) a minimum of sixteen Mbytes RAM, a CD drive and a hard drive with 840 Mbytes, with approximately thirty Mbytes of free disk space (for external storage 112). The computer system 100 preferably runs Microsoft Windows 95 as its operating system.

The preferred display 110 is an 800 x 600 active color matrix display with sixteen-bit color. The preferred printer 112 is at least an ink jet color printer.

While the preferred computer system is a stand-alone system, in other embodiments the computer system 100 is connectable to a network of computers so that some or all of its processing functions, for example, for complex tasks, can be off loaded to other computers on the network. In network environments some or all of the data may reside at remote locations.

The architecture of a preferred embodiment of the order generator is shown in FIGURE 2 wherein the order generator 114 uses a modelling tool 116 connected to a custom user interface 118. Both the modelling tool 116

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and the custom user interface 118 access (read and/or write) various databases, including a product attribute database 120. The user interface 118 also accesses a meta file 121 which it uses to share data through a symbol library 123 with a CAD package 124.

The modelling tool 116 takes as input various user configuration specifications via the custom user interface 118, verifies their validity and determines their pricing. This information can be passed back to the custom user interface 118 or it can be used by a project specifier 122, in conjunction with the CAD package 124, to produce an actual order 125. The project specifier 122 also takes input from a product catalog 129 in order to produce the actual order 125.

In one aspect, the custom user interface 118 operates as a front-end to the modelling tool 116, providing it with user requirements, user specified furniture configurations and other information and obtaining from it configuration information including whether or not a configuration is valid and the price of the configuration.

Preferably the modelling tool 116 is one which uses a generative approach for configuring systems. Such a system is available from Trilogy Development Group of Austin, Texas, and is described in United States Patent No. 5,515,524, "Method and Apparatus for

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Configuring Systems," to Lynch et al, already incorporated by reference herein in its entirety.

Lynch's system, in order to configure a product, accepts input in the form of requests or needs. Using this information, Lynch's system configures a system by identifying the resource and component needs, constraints imposed on or by the resources or components identified, and the structural aspects of the system.

Thus, in the present invention, the modelling tool 116 is programmed to configure office furniture systems by identifying the component needs, resources, and constraints imposed on or by the resources or components identified, and the structural aspects of the system. For example, a particular storage requirement may require a certain type of panel. If a user requires that type of storage then the appropriate type of panel must be used.

The model can handle both configuration and checking functions. In the preferred embodiment, three-dimensional objects and their topological relationships are modelled. The attributes modeled include, but are not limited to:

size (x, y, z dimensions);
color;
texture;

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finish (fabric/direction, wood/direction,
laminate, glass, metal);
obsolescence;
power (electric); and
weight.

5

The modelling system 116 can connect workstations,
recognize and fix common walls, resolve component
duplication and overlap, indicate obstacles and resolve
power connectivity. For example, with regard to panel
connectivity, angles are confined to a limited number
of fixed positions. As to common walls, from a two-
dimensional representation of a layout, the system
ensures that the correct number of parts is calculated.

10

The modelling system 116 bases its determinations
on the input user requirements and on information in
the product attribute database. It also uses a model
of the inter-relationships between the various
components. An example of such a model is shown in the
tables appearing at the end of this specification.

15

In an alternate embodiment of the order generation
system 115, as shown in FIGURE 3, the functions of the
project specifier are incorporated into the modelling
tool 116 and there is tight coupling of the modelling
tool to a CAD program. In this embodiment of the order
generation system 115, there are two integrated

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interfaces to the modelling tool 116, namely a custom user interface 124 and a custom design interface 126.

System Operation

5 The operation of the order generation system 114, particularly the custom user interface 118, on computer system 100 is now described with reference to FIGURES 1-15. The custom user interface 124 of the alternative embodiment 115 shown in FIGURE 3 operates in the same
10 manner.

 When the order generation system 114 begins running on computer system 100, the user is presented with a start screen on the display 110 of computer system 100 (at P100 in FIGURE 4). The start screen
15 presents the user with various user selectable options. The options are presented as demarcated text areas or as icons on the screen depicted on the display 110 of the computer system 100. Each presented option can be
20 selected with the pointer device 104 or using one or more keys on the keyboard 102. An option is selected in a known manner such as by clicking the pointer device 104 on the area of the screen on which the option is displayed.

 When an option is selected, the custom user
25 interface 118, running on computer system 100, determines which option has been selected and then

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either processes the option or effects processing of that option. For example, some options are processed entirely within the user interface 118 itself, whereas others require processing by other components of the system 114, in particular by the modelling tool 116.

5 Generally the custom user interface 118 keeps track of user information at a project level. For each project the custom user interface 118 gets information from the user and then tracks and stores that information as needed. The information is tracked and stored in a manner known in the art such as in a data structure or database which can be accessed as needed. When the user interface 118 requires information regarding product attributes, it obtains that information from the product attribute database 120.

10 When, as the result of some implicit or explicit user request, the user interface 118 requires some processing to be performed by the modelling tool 116, the user interface 118 invokes the appropriate functionality of the modelling tool 116 and gives the modelling tool 116 whatever data is needed. For example, if, as will be described below, the user requests, via the user interface 118, that the modelling tool 116 check the validity of a furniture configuration, then the user interface 118 will pass to

20 the modelling tool 116 the appropriate data

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representing the current configuration. Using the data it receives about the configuration from the user interface 118, along with whatever information it needs from the product attribute database 120, along with the model of the system, the modelling system will then, as requested, check the configuration of the configuration. The result of the configuration check by the modelling tool 116 is not simply a binary "valid" or "invalid" result, but, when possible, is a valid configuration. Thus, the modelling tool 116 is able to pass back configuration data to the user interface 118.

From the start screen presented to the user by the user interface 118, the user is given the option of either loading an existing project (i.e., a project which was previously saved by the order generation system 114) (at P102), or beginning a new project (at P104). If the user selects the option to open an existing project, then the order generation system 114, via the user interface 118, prompts the user for the name under which that project was saved. If the named project can be found, the order generation system 114 retrieves the project and loads it into the system, otherwise the user is prompted for another project name or to start a new project.

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If the user selects the option to create a new project (at P104), then the user is prompted (at P106) to input the needs of the project on a series of planning guide screens. Based on the user's input into the planning guide screens, the order generation system
5 114 determines which options to present to the user in subsequent display screens.

For example, the user interface 118 compiles or translates the entered user requirements into criteria
10 which both it and the modelling tool 116 can use. Then, when requesting a list of components which meet the user's needs, the user interface and, when necessary, the modelling tool 116, can query the requirements to ensure that they are met.

15 One example of such a use would be if the user's needs included standing privacy and lockable storage space. Then, as described below, when the user requested a list of typical configurations satisfying his needs, those which did not provide standing privacy
20 and lockable storage would be excluded.

The various planning requirements (user needs) for which the user is prompted include, but are not limited to, privacy requirements, storage requirements, conferencing criteria, electrical/computer space and
25 connection requirements, space requirements, budget constraints, lighting requirements and types of use.

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As to privacy options, the user is given the option of specifying the privacy requirements in terms of panel heights or in terms of various types of privacy: "seating privacy", "standing privacy",
5 "acoustic privacy" and the like. If the user selects certain types of privacy, the order generation system 114 translates this selection into a panel height selection. In preferred embodiments the user is presented with images such as shown in FIGURE 5 in order
10 to explain the various privacy options.

Preferably the planning guide consists of a series of forms which are graphically displayed on the screen, each form having a number of options. Once the user selects a particular option, a screen for that option
15 is displayed with questions about the various sub-options. For example, in order to determine the user's storage requirements, the user selects a storage requirements option and is presented with a storage requirements screen. As shown in FIGURE 6, this screen
20 includes pictures of various types of storage along with textual descriptions of the items which can be stored in each kind of storage.

In some embodiments the user is also provided with an optional tour through a virtual showroom. This tour
25 would consist of a multimedia (e.g., Quicktime etc.) tour through a showroom demonstrating the various

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product lines available and various configurations of those products.

Once the user has completed the planning (at P106) or opens an existing project (at P102) the order generation system 114 provides the user with various options described below. In general, navigation in the order generation system 114 is non-modal. That is, any display screen can be reached from any other display screen and user selected instructions or operations (at P108) are performed (at P110), in effect, either by the user interface 118 or by some other part of the order generation system 114 such as the modelling tool 116. Generally, when a user selects an instruction, the order generation system 114 running on computer system 100 performs that instruction. Preferably the user interface 118 performs as many functions as it can, passing requests to the modelling tool 116 only as needed.

Thus, as shown in FIGURE 7, each display screen 127 includes various user selectable icons (128-174). Preferably, the icons (128-174) are grouped and positioned on the screen 124 according to their type of functionality. For example, icons 128-133 relate to project maintenance (saving and restoring) and printing functions; icons 134 and 136 relate to editing functions; icons 138-160 relate to configuration and

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customization functions; icons 162 and 164 relate to image positioning and moving functions; planning guide icon 166 relates to the planning guide functionality (described above) and the home icon 168 returns the user to the start (or home) display screen. The window control icons 170-174 are used to size and position the display screen 126 on the display 110.

When the user selects (by clicking on it with the pointer device 104) the new project icon 128, then the user is prompted for the name of the new project and a new project is created.

When the user selects the save project icon 130, the order generation system 114 saves the current project to a storage device connected to the computer system 100. The user has the option of changing the name of the project when it is saved.

When the user selects the open project icon 132, the user is prompted for the name of the project to be opened. If the project of that name is found then it is opened and replaces the current project in the order generation system 114.

When the user selects the print icon 133, then the user interface 118 prints the current project.

When the user selects the delete icon 134, then order generation system 114 deletes the current

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selection (on the display). The undo icon 136 is used to undo previous deletions.

The configuration icons 138-148 are now described in greater detail.

5 By selecting the new typical icon 142, the user is able to select a typical workstation configuration which satisfies the user's requirements input in the planning stage (at P106).

10 When the user selects the new typical icon 142 a graphical depiction of various typical workstation configurations 180 is displayed on the screen. Each of these displayed typical configurations should satisfy some of the user's requirements, at least with regard to privacy, work area and electrical connectivity.
15 Price and space requirements cannot always be satisfied until a complete clustered configuration is determined.

The user can select one of the displayed typical workstation configurations by clicking on it with the pointer device 104. The selected typical configuration
20 is highlighted and displayed on the screen (at 182).

The system is pre-configured with a number of so-called typical configurations, and preferably the typicals displayed on the typical screen are those which satisfy the customer's criteria entered at the
25 customer needs screen (reached by selecting the planning guide icon 166).

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Once the user has selected the typical configuration that is to be used, the user can then double click with the pointer device 104 on the depiction of that typical in order to view it and operate on it. At that time the order generation system 114 displays a three-dimensional view of the selected typical on the screen on display 110 (FIGURE 8). Preferably the selected typical furniture configuration is displayed with the appropriate colors and textures.

With reference to FIGURE 8, the user can rotate and move the selected depicted typical workstation using the zoom icon 162 and the move icon 164, respectively. The depiction of the workstation can also be moved and rotated using the pointer device positioned on the object and then moved around the screen area. In this way the user can view the workstation from various angles and positions.

Preferably the image is displayed in a selected color and with a selected texture, that is, in the color and texture of the actual product. Selection of color and texture will be described below.

At any time, the typical configuration displayed on the screen can be modified by the user. This modification can be in the form of adding or removing

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components, changing the shape, size or color of a component or changing the properties of a component.

5 While viewing a configuration, the user can select product options. In order to pick product options, the user points and clicks the pointer device on the select material icon 148 on the screen 126. This causes the computer 100 to display the various materials screen on the display 110.

10 The properties screen allows the user to specify a workstation at a detailed level. Every attribute of every part in the workstation can be selected to create a customer's configuration which is then displayed on the screen. The system only allows a user to select valid attributes for each particular component. In
15 that way each displayed configuration is consistent and valid as to its attributes.

In order for the user to resize or reshape components, as shown in FIGURE 9, the user selects the component 182 to be changed using the pointing device
20 104. When this is done, the selected component becomes highlighted on the screen and arrows (184-192) are shown to depict the various directions in which the part can be resized. The selected part 182 can also be repositioned at another location.

25 The order generation system 114 will only allow components to be resized or reshaped to valid shapes.

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To ensure this requirement, the user interface 118 checks each resize and reshape operation, while it is ongoing, using the product attribute database 120. However, components can be moved to temporarily invalid locations. As described below, if a component is moved, the configuration will have to be checked and may have to be changed.

In the example shown in FIGURE 9, after the user has resized the component, the support 189 is too long. When the user selects the configuration option 150, the graphical user interface 118 invokes the modelling tool 116 which will replace the support 189 with one of the correct length.

The user can apply fabric and finishes to a typical product by selecting the select material icon 146 with the pointer 104. This enables the user to change all fabric and finish options on each individual component or on all components. When the user selects the select material icon 146, order generation system 114 presents the user with fabric color and finish options on the screen as shown in FIGURE 10. The order generation system 114 will only allow the user to change fabric or finish to valid (manufacturable components in the product line) options for the current components. In this way, the configuration depicted on the screen is always valid with respect to its fabric

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and finish. In order for the user to change a fabric or color, the user selects the appropriate option from those shown on the screen. The fabrics/colors are presented in families (three families in the example in
5 FIGURE 10), so that selecting one color for a particular component will change the other parts of that component to the appropriate color from the family.

If, at any time, the user wants to capture an image of the configuration depicted on the screen, the
10 user can select the snapshot icon 152 which causes the rendered image to be enhanced by sharpening and adding depth. These images can then be printed or cut and pasted into other applications.

The user can add components to the depicted
15 typical by selecting the component icon 140 with the pointer device. This causes the order generation system 114 to present the user with a selection of components which can be added to the configuration (FIGURE 10). The selection includes shelves, panels,
20 storage areas and the like. Generally any component from the product line can be added to a configuration.

Once a particular component is selected, the user positions that component on the typical configuration. The order generation system 114 will allow the user to
25 position the component at an invalid location, since it is assumed that the entire configuration will be

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checked, and possibly adjusted, later. Thus, for example, the user is able to put a shelf on a panel that cannot support the shelf. This is acceptable since later the system will be reconfigured to replace
5 the panel with one which can support the shelf. Alternatively, if no supporting panel is available in the product line, the shelf will not be added.

In order to check the validity (that is, if it can be manufactured from the specified product line and is
10 otherwise a valid configuration) of a modified workstation, the user selects the configuration check icon 150 from the screen 126. This causes the order generation system 114 to invoke the checker module which ensures validity of the depicted configuration.
15 Generally, the modelling tool 116 may indicate that the configuration is not feasible, feasible or it may provide various modifications. For example, it may recognize that one component may be split into two or vice versa. It will insert the appropriate support
20 structure to ensure that the configuration can be built.

Once the modelling tool 116 is done with its processing, it returns control to the user.

Once the user is satisfied with a particular
25 typical configuration for a workspace, the user can generate a cluster of those typicals. In order to do

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this the user selects the "cluster" icon 144 from the screen 126. This causes the order generation system 114 to present the user with various clustering options (FIGURE 12). The user can then select one of the
5 displayed clustering options and the order generation system 114 generates the appropriate cluster of the current typical.

In generating a cluster of typicals, the order generation system 114 invokes the modelling tool 116 to
10 ensure that the cluster is feasible. The modelling tool 116 removes redundant structures such as common walls and replaces multiple parts with individual parts if possible. If necessary the modelling tool 116 also checks the typical to ensure that it is a valid
15 configuration.

When done, the modelling tool 116 presents the user with a display of the selected cluster of typicals as shown in FIGURE 13.

The user can add other detached items such as
20 chairs to a configuration. To do this, the user selects the seating selection icon 138 from the screen 126. When this is done the order generation system 114 presents the user with a display of chairs such as shown in FIGURE 14. The user can select one of the
25 depicted chairs and that chair will be placed (freestanding) in the current cluster or typical.

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Once the current typical and/or cluster configuration is acceptable to the user, its price can be determined using the price icon 156. Selecting the price icon 156 causes the order generation system 114
5 to determine the price of the entire configuration and to present it to the user as shown in FIGURE 15. As can be seen from the quote depicted in FIGURE 15, at this time each component item in the configuration is listed and details about that item are given. This quote is
10 for a valid configuration and can be sent directly to the ordering department.

Alternatively, in some embodiments, when a finalized configuration is determined, the quote may be an estimate requiring checking.

15 As noted above, the modelling system 116 bases its determinations on the input user requirements and on information in the product attribute database. It also uses a model of the inter-relationships between the various components. An example of such a model is
20 shown in the following tables.

In the relationship maps below, the properties are coded as follows: "L" = load bearing, "N" = Non-load bearing, "A" = Provides Aft Support, and "G" = Supplies Ground (Floor) Support.

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								Attached Conference End Units		4000
								premise_conference_end_unit	PRM	4000
								Attached Returns		4000
								premise_return	PRM	4000
								places_return	PLC	4000
								places_transition_return	PLC	4000
								Attached Vertical Storage Units		4000
								premise_vertical_storage_unit	PRM	4000
								places_vertical_storage_unit	PLC	4000
								Attached Caseloads Shelves		4000
								premise_bookcase_shelf	PRM	4000
								premise_storage_unit_shelf	PRM	4000
								places_bookcase_shelf	PLC	4000
								places_storage_unit_shelf	PLC	4000
								places_wardrobe_shelf	PLC	4000
								series_950_bookcase_shelf	PLC	4000
								series_950_cabinet_shelf	PLC	4000
								series_950_overfile_shelf	PLC	4000

		Attached Credenzas			4000
		places_attached_credenza	PLC		4000
		series_950_credenza_file	PLC		4000
					8000
		Mobile Units			8000
		Mobile Peds			8000
		premise_mobile_pedestal	PRM		8000
		places_mobile_pedestal	PLC		8000
		unigroup_mobile_pedestal	UN		8000
					8000
		Mobile Tables			8000
		premise_mobile_conference_end	PRM		8000
		premise_mobile_teardrop_table	PRM		8000
		places_mobile_conference_end_ta	PLC		8000
		places_mobile_keyboard_table	PLC		8000
		places_mobile_machine_table	PLC		8000
		places_mobile_round_table	PLC		8000
		places_mobile_teardrop_table	PLC		8000
		unigroup_mobile_keyboard_table	UN		8000
		unigroup_mobile_machine_table	UN		8000
					8000
		Mobile Storage Units			8000
		new_views_mobile_cabinet	PLC		8000
					9000
		Stationary Units			9000
		Stationary Peds			9000
		places_stationary_fundamental_pe	PLC		9000
		places_stationary_pedestal	PLC		9000
		unigroup_stationary_fundamental	UN		9000
		unigroup_stationary_pedestal	UN		9000
					9000
		Stationary Tables			9000
		premise_rectangular_table	PRM		9000
		premise_round_table	PRM		9000
		premise_stationary_conference_en	PRM		9000
		premise_stationary_teardrop_table	PRM		9000
		places_c_leg_table	PLC		9000
		places_oval_table	PLC		9000
		places_racetrack_table	PLC		9000
		places_rectangular_table	PLC		9000
		places_square_table	PLC		9000
		places_stationary_conference_end	PLC		9000
		places_stationary_machine_table	PLC		9000
		places_stationary_round_table	PLC		9000
		places_stationary_teardrop_table	PLC		9000
		places_table_desk	PLC		9000
		unigroup_oval_table	UN		9000
		unigroup_rectangular_table	UN		9000
		unigroup_round_table	UN		9000
		unigroup_square_table	UN		9000
					9000
		Stationary Vertical Files			9000
		Stationary Lateral Files			9000
		premise_stationary_lateral_file	PRM		9000
		places_stationary_lateral_file	PLC		9000
		series_950_combination_lateral_fil	PLC		9000
		series_950_lateral_file	PLC		9000
					9000
		Stationary Bookcases			9000
		premise_bookcase	PRM		9000
		places_bookcase	PLC		9000
		series_950_bookcase	PLC		9000
					9000
		Stationary Desks			9000

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								places_glazed_oblique_panel	PLC	1000
								Places Solid Panels		1000
								Places Standard Solid Panels		1000
								places_solid_panel	PLC	1000
								interior_solid_panel	UN	1000
								Places Gabled Solid Panels		1000
								places_gabled_panel	PLC	1000
								Places Oblique Solid Panels		1000
								places_oblique_panel	PLC	1000
								Places Beltline Solid Panels		1000
								places_beltline_panel	PLC	1000
								Places Ported Solid Panels		1000
								places_ported_panel	PLC	1000
								Stacked Verticals		2000
								Stack Kits		2000
								Pads		2000
								Extender Screens		2000
								Desking Screens		2000
								Fan Lights		6000

					places_fanlight	PLC	6000
							2000
				Modesty Panels			
					places_convergent_modesty_pane	PLC	2000
					places_corner_modesty_panel	PLC	2000
					places_straight_modesty_panel	PLC	2000
							9000
				Vertical Accessories			
					places_blind_kit	PLC	9000
					places_counter_top_end_cover	PLC	9000
					places_electronic_work_surface_e	PLC	9000
					places_muntin_kit	PLC	9000
					places_wainscot_kit	PLC	9000
							9000
							3000
				Horizontals			3000
				Work Surfaces			3000
				Corner Work Surfaces			3000
				Height Adjustable Corner Work Surfaces			3000
					places_height_adjustable_corner_v	PLC	3000
					places_height_adjustable_split_cor	PLC	3000
							3000
							3000
							3000
				Regular Corner Work Surfaces			3000
					premise_corner_work_surface	PRM	3000
					premise_wrap_around_work_surfa	PRM	3000
					places_corner_work_surface	PLC	3000
					places_wrap_around_work_surface	PLC	3000
							3000
							3000
							3000
				Electronic Corner Work Surfaces			3000
					places_electronic_corner_work_sur	PLC	3000
							3000
							3000
				Transitional Corner Work Surfaces			3000
					premise_transitional_wrap_around	PRM	3000
					places_transitional_corner_work_s	PLC	3000
					places_transitional_wrap_around_v	PLC	3000
							3000
							3000
							3000
				Rectangular Work Surfaces			3000
				Height Adjustable Rectangular Work Surfaces			3000
					places_height_adjustable_rectangu	PLC	3000
							3000
				Regular Rectangular Work Surfaces			3000
				Premise Regular Rectangular Work Surfaces			3000
					premise_radiused_rectangular_wor	PRM	3000
					premise_rectangular_work_surface	PRM	3000
					premise_split_rectangular_work_su	PRM	3000
							3000
				Places Regular Rectangular Work Surfaces			3000
					places_monitor_work_surface	PLC	3000
					places_radiused_rectangular_work	PLC	3000
					places_rectangular_work_surface	PLC	3000
					places_rectangular_work_surface	PLC	3000
					places_split_rectangular_work_sur	PLC	3000
							3000
							3000
							3000
							3000

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					Electronic Rectangular Work Surfaces		3000
					places_electronic_rectangular_wor	PLC	3000
					undo_electronic_rectangular_wor	UN	3000
					Transitional Rectangular Work Surfaces		3000
					premise_transitional_rectangular_w	PRM	3000
					places_transitional_rectangular_wd	PLC	3000
					undo_transitional_rectangular_wd	UN	3000
					Convergent Work Surfaces		3000
					Regular Convergent Work Surfaces		3000
					premise_convergent_work_surface	PRM	3000
					places_convergent_work_surface	PLC	3000
					undo_convergent_work_surface	UN	3000
					Shaped Convergent Work Surfaces		3000
					premise_shaped_wrap_around_wd	PRM	3000
					places_shaped_wrap_around_work	PLC	3000
					undo_shaped_wrap_around_work	UN	3000
					Conference Ends		3000
					Regular Conference Ends		3000
					premise_conference_end_work_su	PRM	3000

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								places_90_connector_cover	PLC	7000
								places_45_connector_cover	PLC	7000
								places_22_5_connector_cover	PLC	7000
								Connectors		7000
								T-Mount Kit		7000
								new_views_t_mount_bracket	PLC	7000
								Standard Connectors		7000
								premise_connector	PRM	7000
								places_hinge	PLC	7000
								places_hinge	PLC	7000
								Modesty Panel Supports		7000
								places_modesty_to_cabinet_bracket	PLC	7000
								places_modesty_to_panel_bracket	PLC	7000
								Posts		7000
								Upper Posts		7000
								Lower Posts		7000
								Architectural Connections		7000

		Horizontal Supports				7000
		Table Bases				7000
		Brackets				7000
		Panel Attached Brackets				7000
				premise_pedestal_to_panel_brack	PRM	7000
				premise_work_surface_cantilever	PRM	7000
				premise_work_surface_corner_bra	PRM	7000
				places_included_work_surface_car	PLC	7000
				places_work_surface_cantilever	PLC	7000
				places_work_surface_corner_brack	PLC	7000
				places_work_surface_panel_moun	PLC	7000
				places_work_surface_side_mount	PLC	7000
				places_work_surface_slope_mount	PLC	7000
				series_950_credenza_file_work_su	PLC	7000
				drop_down_work_surface_cantilever	PRM	7000
				drop_down_work_surface_panel	PRM	7000
				drop_down_work_surface_corner	PRM	7000
				drop_down_work_surface_slope	PRM	7000
				Non-Panel Attached Brackets		7000
				premise_work_surface_drop_moun	PRM	7000
				premise_work_surface_flush_moun	PRM	7000
				new_views_cabinet_to_work_surfa	PLC	7000
				places_work_surface_drop_mount	PLC	7000
				places_work_surface_flush_mount	PLC	7000
				drop_down_work_surface_drop_moun	PRM	7000
				drop_down_work_surface_flush_moun	PRM	7000
				Legs		7000
				premise_work_surface_support_leg	PRM	7000
				places_work_surface_support_leg	PLC	7000
				drop_down_work_surface_support_leg	PRM	7000
				Worksurface Support Panels		7000
				premise_work_surface_support_pa	PRM	7000
				places_conference_end_support	PLC	7000
				places_work_surface_end_full_sup	PLC	7000
				places_work_surface_end_half_su	PLC	7000
				places_work_surface_support_pan	PLC	7000
				drop_down_work_surface_support_pan	PRM	7000
				Height Adjustment Kits		7000
				premise_lateral_file_height_adju	PRM	7000
				premise_pedestal_height_adjustme	PRM	7000
				premise_storage_unit_height_adju	PRM	7000
				Adjustable Supports		7000
				places_height_adjustable_corner_r	PLC	7000
				places_height_adjustable_rectangu	PLC	7000
				places_height_adjustable_split_cor	PLC	7000
				drop_down_height_adjustable_corner	PRM	7000
				drop_down_height_adjustable_rectangu	PRM	7000
				drop_down_height_adjustable_split_cor	PRM	7000
				Seating		8000
				Auditorium Seating		8000
				Adjustable Seating		8000
				accolade_caster_base_chair	STG	8000
				accolade_caster_base_stool	STG	8000
				improv_caster_base_chair	STG	8000
				improv_he_caster_base_chair	STG	8000

[illegible]

					Uninterruptible Power Supply	UN	5000
							5000
					Out-Feeds		
					premise_base_igr_receptacle	PRM	5000
					premise_base_receptacle	PRM	5000
					premise_panel_communications_p	PRM	5000
					premise_panel_power_port_kit	PRM	5000
					places_base_igr_receptacle	PLC	5000
					places_base_igr_surge_protector	PLC	5000
					places_base_receptacle	PLC	5000
					places_smart_work_surface_power	PLC	5000
					places_switching_system_kit	PLC	5000
					places_switching_system_power_s	PLC	5000
					places_switching_system_receptac	PLC	5000
					places_switching_system_wall_swi	PLC	5000
					places_work_surface_duplex_rece	PLC	5000
					places_work_surface_power_modu	PLC	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					Power and Data Routers		5000
					Power and Data Channels		5000
					premise_vertical_wire_manager	PRM	5000
					places_cable_management_post	PLC	5000
					places_horizontal_wire_manager_3	PLC	5000
					places_horizontal_wire_manager_4	PLC	5000
					places_variable_height_cable_man	PLC	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					Power and Data Connectors		5000
					premise_extended_power_connect	PRM	5000
					premise_flexible_power_connector	PRM	5000
					premise_straight_span_power_con	PRM	5000
					places_base_to_beltline_power_co	PLC	5000
					places_beltline_to_beltline_power	PLC	5000
					places_extended_power_connecto	PLC	5000
					places_flexible_power_connector	PLC	5000
					places_straight_power_connector	PLC	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					premise_base_igr_receptacle	UN	5000
					Cable Management		5000
					premise_grommet	PRM	5000
					premise_wire_management_loop	PRM	5000
					places_cable_management_beltlin	PLC	5000
					places_cable_management_ported	PLC	5000
					places_cable_management_top_ca	PLC	5000
					places_grommet	PLC	5000
					places_wire_basket	PLC	5000
					places_wire_management_loop	PLC	5000
					places_wire_management_module	PLC	5000

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								places_wire_manager	PLC	5000
								places_work_surface_power_modu	PLC	5000
								horizontal_work_surface_power_modu	UNL	5000
								horizontal_work_surface_power_modu	UNL	5000
								horizontal_work_surface_power_modu	UNL	5000
								horizontal_work_surface_power_modu	UNL	5000
								Lighting		6000
								Horizontally Mounted Lighting		6000
								premise_task_light	PRM	6000
								premise_vertical_storage_task_light	PRM	6000
								places_canopy_light	PLC	6000
								places_counter_top_task_light	PLC	6000
								places_freestanding_pivot_head_t	PLC	6000
								places_task_light	PLC	6000
								places_counter_top_task_light	UNL	6000
								places_freestanding_pivot_head_t	UNL	6000
								places_task_light	UNL	6000
								Vertically Mounted Lighting		6000
								places_grid_hung_pivot_head_task	PLC	6000

		places_panel_hung_fluorescent_lig	PLC	6000
		places_panel_hung_pivot_head_ta	PLC	6000
		places_panel_mounted_fluorescen	PLC	6000
		places_post_mount_street_light	PLC	6000
		places_street_light	PLC	6000
		places_street_light_fixture	PLC	6000
		places_street_light_fixture	PLC	6000
		places_street_light_fixture	PLC	6000
		places_street_light_fixture	PLC	6000
		places_street_light_fixture	PLC	6000
		places_street_light_fixture	PLC	6000
	Floor Mounted Lighting			6000
	Lighting Accessories			6000
		places_fluorescent_light_saddle_m	PLC	6000
		places_painted_shelf_task_light_br	PLC	6000
		places_vertical_storage_task_light	PLC	6000
		places_wood_shelf_task_light_brac	PLC	6000
		places_wood_shelf_task_light_brac	PLC	6000
		places_wood_shelf_task_light_brac	PLC	6000
		places_wood_shelf_task_light_brac	PLC	6000
		places_wood_shelf_task_light_brac	PLC	6000
	Organization			9000
	Tackable Surfaces			9000
		premise_tackboard	PRM	9000
		places_grid_tackstrip	PLC	9000
		places_tackboard	PLC	9000
		places_tackboard	PLC	9000
	Markable Surfaces			9000
		premise_markerboard	PRM	9000
		places_markerboard	PLC	9000
		places_markerboard	PLC	9000
	Workflow Devices			9000
	Vertical Workflows			9000
		premise_all_purpose_hook	PRM	9000
		premise_lateral_file_drawer_compr	PRM	9000
		premise_lateral_file_drawer_divide	PRM	9000
		premise_lateral_file_front_to_back	PRM	9000
		premise_lateral_file_side_to_side	PRM	9000
		premise_pedestal_drawer_divider	PRM	9000
		premise_shelf_divider	PRM	9000
		paper_management_bar	PLC	9000
		paper_management_freestanding	PLC	9000
		paper_management_suspended_v	PLC	9000
		new_views_shelf_divider	PLC	9000
		places_all_purpose_hook	PLC	9000
		places_fundamental_pedestal_han	PLC	9000
		places_fundamental_pedestal_side	PLC	9000
		places_lateral_file_front_to_back	PLC	9000
		places_organization_grid	PLC	9000
		places_shelf_divider	PLC	9000
		places_vertical_storage_unit_grid	PLC	9000
		tri_mode_paper_management_bar	PLC	9000
		tri_mode_vertical_unit	PLC	9000
		series_950_drawer_compressor	PLC	9000
		series_950_drawer_divider	PLC	9000
		series_950_front_to_back_hanging	PLC	9000
		series_950_side_to_side_hanging	PLC	9000

										tri_mode_diagonal_unit	PLC	9000
												9000
										places_grid_diskette_bin	PLC	9000
										places_grid_storage_bin	PLC	9000
												9000
										Services		

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Relationship Maps (part 1 of 34)

Class Structure	Component Name	Prod Line	Proper- ties	Inher- its	From	C#	Constraint Relationships	L#	Light Weight Relationships
Environments					N/A			1	"LWC: Environments" (Overridden at lower class levels)
Service Parts					\$A\$3			???	
Interdependant Systems					N/A			???	
Casegood Systems					\$B\$5			???	
Hanging Units					\$C\$6	1	"Hang Stuff" AND "HU"	1	"LW Hang Stuff"
Hanging Shelves					\$D\$7	Inh		Inh	
	premise_shelf	PRM				Inh		Inh	
	places_display_shelf	PLC				Inh		Inh	
	places_media_shelf	PLC				Inh		Inh	
	places_mini_corner_shelf	PLC				Inh		Inh	
	places_mini_end_of_run_shelf	PLC				Inh		Inh	
	places_mini_straight_shelf	PLC				Inh		Inh	
	places_monitor_shelf	PLC				Inh		Inh	
	places_pass_through_shelf	PLC				1	Requires an open panel	1	Override x/z_pos such that panel bisects shelf
	places_shelf_with_coat_rod	PLC				Inh		Inh	
Hanging Lateral Files					\$D\$7	Inh		Inh	
	places_hanging_lateral_file	PLC				Inh		Inh	
Hanging Storage Units					\$D\$7	Inh		Inh	
	premise_overhead_unit	PRM				Inh		Inh	
	places_overhead_unit	PLC				Inh		Inh	
	places_shelf_with_flipper_door	PLC				Inh		Inh	
Attached Units					\$C\$6	1	If attaching to a member of X_Credenzas or X_Desks, must attach to the "open" front		

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Relationship Maps (part 2 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
Attached Peds	premise_attached_pedestal	PRM	AFG	\$D\$25	1	"AP"	1	"Set AP Depth" and "Place Storage"
	places_attached_fundamental_pedestal	PLC	AFG	#REF!	1	"AP prm-ap"		
	places_attached_pedestal	PLC			Inh		Inh	
Attached Lateral Files					Inh		Inh	
			AFG	\$D\$25	1	"ALF"	1	"Place Storage"
	premise_attached_lateral_file	PRM			1	"ALF prm-all"	Inh	
Attached Bridges	places_attached_lateral_file	PLC			Inh		Inh	
				\$D\$25	1	"AB"	1	"Center on Floor" AND "Attach Bridge/Return"
	premise_bridge	PRM			Inh		Inh	
Attached Cabinets	places_bridge	PLC			Inh		Inh	
	places_transition_bridge	PLC			Inh		Inh	
				\$D\$25				
Upper Attached Cabinets				\$E\$37				
	new_views_upper_unit	PLC			1	"UAC nv-uu"	???	
	series_950_overfile	PLC			???	Must sit on top of ???	???	

Relationship Maps (part 3 of 34)

Class Structure		Component Name		Prod Line	Proper ties	Inher- its	Constraint		Light Weight	
						From	C#	Relationships	L#	Relationships
		Lower Attached Cabinets							???	
		premise_attached_storage_unit		PRM		\$E\$37	1	"LAC"	???	
							1	"LAC prm-asu"	???	
		new_views_lower_unit		PLC						"Center on Floor" and "Set LWC Position Attached Lateral File And Storage Unit"
		places_credenza_door_unit		PLC			1	"LAC nv-lu"	1	
							???		???	
		Attached Corner Units						Both sides must attach to a member of Attached_Returns/ Bridges/ Credenzas/ Desks		
		premise_corner_unit		PRM		\$D\$25	1		1	"Center on Floor"
		premise_wrap_around_unit		PRM			Inh		Inh	
							Inh		Inh	
		places_corner_unit		PLC			Inh		Inh	
		Attached Convergent Units								
		premise_convergent_unit		PRM		\$D\$25	1	"AConvU"	1	"Center on Floor"
						49	Inh		Inh	
		premise_convergent_wrap_around_d_unit		PRM			Inh		Inh	
							Inh		Inh	
		places_convergent_unit		PLC			Inh		Inh	
		Attached Conference End Units								
		premise_conference_end_unit		PRM		\$D\$25			1	"Center on Floor"
							Inh		Inh	
		Attached Returns								
		premise_return		PRM		\$D\$25	1	"ARet"	1	"Center on Floor"
							Inh		Inh	
		places_return		PLC						
							1	If 30" panel used as return, WS must use brackets, not cantilevers	Inh	
		places_transition_return		PLC			1	If 30" panel used as return, WS must use brackets, not cantilevers	Inh	

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Relationship Maps (part 4 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher- its	Constraint		Light Weight	
					From	C#	Relationships	L#
Attached Vertical Storage Units	premise_vertical_storage_unit	PRM		\$D\$25	1 "AVSU"			1 "Center on Floor"
	places_vertical_storage_unit	PLC			Inh			Inh
					Inh			Inh
Attached Casegoods Shelves				\$D\$25				1 LWC: ACS
	premise_bookcase_shelf	PRM			n/a	ACCESSORY		n/a
	premise_storage_unit_shelf	PRM			n/a	ACCESSORY		n/a
	places_bookcase_shelf	PLC			n/a	ACCESSORY		n/a
	places_storage_unit_shelf	PLC			n/a	ACCESSORY		n/a
	places_wardrobe_shelf	PLC			n/a	ACCESSORY		n/a
	series_950_bookcase_shelf	PLC			n/a	ACCESSORY		n/a
	series_950_cabinet_shelf	PLC			n/a	ACCESSORY		n/a
Attached Credenzas	series_950_overfile_shelf	PLC			n/a	ACCESSORY		n/a
				\$D\$25	1 X Corners or X Desks			1 "Center on Floor"
	places_attached_credenza	PLC			Inh			Inh
	series_950_credenza_file	PLC						Inh

Relationship Maps (part 5 of 34)

Class Structure		Component Name		Prod Line	Prop- ties	Inher- its	C#	Constraint	L#	Light Weight
						From		Relationships		Relationships
	Mobile Units					\$C\$6	1	Must sit on floor	1	"Center on Floor"
	Mobile Peds					\$D\$74				
			premise_mobile_pedestal	PRM			Inh		Inh	
			places_mobile_pedestal	PLC			Inh		Inh	
	Mobile Tables					\$D\$74				
			premise_mobile_conference_end_table	PRM			Inh		Inh	
			premise_mobile_teardrop_table	PRM			Inh		Inh	
			places_mobile_conference_end_table	PLC			Inh		Inh	
			places_mobile_keyboard_table	PLC			Inh		Inh	
			places_mobile_machine_table	PLC			Inh		Inh	
			places_mobile_round_table	PLC			Inh		Inh	
			places_mobile_teardrop_table	PLC			Inh		Inh	
	Mobile Storage Units					\$D\$74				
			new_views_mobile_cabinet	PLC			Inh		Inh	

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Relationship Maps (part 6 of 34)

Class Structure				Component Name		Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships

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Relationship Maps (part 7 of 34)

				Inher-its		Constraint		Light Weight	
Class Structure				Proper-ties	Prod Line	Component Name	From	C#	Relationships
					PLC	places_c_leg_table		???	Inh
					PLC	places_oval_table		???	Inh
					PLC	places_race-track_table		???	Inh
					PLC	places_rectangular_table		???	Inh
					PLC	places_square_table		???	Inh
					PLC	places_stationary_conference_end_table		???	Inh
					PLC	places_stationary_machine_table		???	Inh
					PLC	places_stationary_round_table		???	Inh

Relationship Maps (part 8 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher-its	Constraint		Light Weight	
					C#	Relationships	L#	Relationships
	places_stationary_teardrop_table	PLC			???		Inh	
	places_table_desk	PLC			???		Inh	
Stationary Vertical Files								
				\$D\$88				
Stationary Lateral Files								
	premise_stationary_lateral_file	PRM		\$D\$88	???		Inh	
	places_stationary_lateral_file	PLC			???		Inh	
	series_950_combination_lateral_file	PLC				stands there - is configurable (4 heights) - work like drawer pedestals		
	series_950_lateral_file	PLC				stands there - 2/3/4/5 high - settable via properties		
Stationary Bookcases								
	premise_bookcase	PRM		\$D\$88			Inh	
	places_bookcase	PLC			Inh		Inh	
	series_950_bookcase	PLC			Inh	2/3/4/5 high - settable via properties	Inh	
Stationary Desks								
	premise_desk	PRM		\$D\$88	???		Inh	
	places_desk	PLC			???		Inh	
Stationary Credenzas								
	premise_credenza	PRM		\$D\$88	???		Inh	
	places_stationary_credenza	PLC			???		Inh	
Stationary Wardrobes								
	places_wardrobe	PLC		\$D\$88	???		Inh	

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Relationship Maps (part 9 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher-its	Constraint		Light Weight
					Relationships	L#	
	series_950_wardrobe	PLC			Stands there, only 1 size (uses series_950_storage_cabinet metafile)	Inh	
Stationary Cabinets							
	premise_stationary_storage_unit	PRM		\$D\$88	???	Inh	
	new_views_stationary_cabinet	PLC				Inh	
	new_views_stationary_cabinet	PLC				Inh	
	places_stationary_storage_unit	PLC				Inh	
	series_950_storage_cabinet	PLC			Stands there - 4 or 5 high - no shelves or 3 shelves		
Suspended Units							
				\$C\$6			
Suspended Peds							
	places_suspended_fundamental_pedestal	PLC		\$D\$132	Mounts under WS, Return, Desk, or Credenza - but not a Bridge	1	"Place Storage" AND "LWC: Set SP Depth/Pos"
	places_suspended_pedestal	PLC				Inh	
Suspended Drawers							
				\$D\$132	Must Mount to Front Edge of Worksurface		
	premise_pencil_drawer	PRM				???	
	places_pencil_drawer	PLC				???	
	places_steel_pencil_drawer	PLC				???	
	places_wood_pencil_drawer	PLC				???	

Relationship Maps (part 10 of 34)

Class Structure		Component Name		Prod Line	Proper ties	Inher- its	C#	Constraint Relationships		L#	Light Weight Relationships	
Casegood Accessories						From						
		premise_lateral_file_counterweight		PRM		\$C\$56		Dep	ACCESSORY	n/a	ACCESSORY (Note: 1 included with 2-highs)	
		premise_vertical_storage_unit_template		PRM				Dep	ACCESSORY	n/a	ACCESSORY	
		places_flipper_door		PLC				???		???		
		places_lateral_file_counterweight		PRM				Dep	ACCESSORY	n/a	ACCESSORY (Note: 1 included with 2-highs)	
		places_tug_a_ped		PLC				Dep	ACCESSORY	n/a	ACCESSORY	
		places_vertical_storage_unit_retrofit_kit		PLC				n/a	ACCESSORY	n/a	ACCESSORY	
		places_vertical_storage_unit_template		PLC				n/a	ACCESSORY	n/a	ACCESSORY	
		series_950_bookcase_top		PLC				Must be the same size as target bookcase				
		series_950_counterweight		PLC				n/a	ACCESSORY	n/a	ACCESSORY	
		series_950_credenza_double_top		PLC				contiguous top for 2 bins of same height and width				
		series_950_credenza_single_top		PLC				used when a CF is in the open				
		series_950_lock_bar		PLC				n/a	ACCESSORY	n/a	ACCESSORY	
		series_950_storage_coat_rod		PLC				n/a	ACCESSORY			
		series_950_storage_media_bar		PLC				n/a	ACCESSORY			
						\$B\$5						
	Wall Systems											
	Verticals					\$C\$156						
	Vertical Bases					\$D\$157						
	Mobile Bases					\$E\$158						
	Sliders					\$F\$159						
	Stationary Bases					\$E\$158						

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Relationship Maps (part 11 of 34)

Class Structure			Component Name		Prod Line	Proper ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
			Beams				\$F\$161				
			Privacy Screens				\$F\$161				
			Scaffolds				\$F\$161				
			Panels				\$F\$161	1	Panels Require Support (Physics Constraint)	1	"LWC: Panels"
			Premise_Panels				\$G\$165	1	"PRM Panels"		
			Premise_Doors				\$H\$166	1	"PRM Doors"		
					premise_door	PRM		Inh		Inh	
			Premise Glazed Panels				\$H\$166				
					premise_glazed_panel	PRM		Inh		Inh	
			Premise Solid Panels				\$H\$166				
					premise_solid_panel			1	"PSP prrm-sp"	Inh	
			Places Panels				\$G\$165	1	"PLC Panels"		
									Door-Swing must match the direction of the return panel and the hinged side of the door should be towards the supporting panels		
			Places Doors				\$H\$173	1	Must have a return panel >=24" deep that's <=24" unloaded standard panel away from hinge		
					places_door	PLC		1		Inh	

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Relationship Maps (part 13 of 34)

Class Structure				Component Name		Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
				places_beltline_panel		PLC		From	Inh		Inh	
				Ported Solid Panels				\$D\$186				
				places_ported_panel		PLC			Inh		Inh	
				Stacked Verticals				\$D\$157				
				Stack Kits				\$E\$197				
				Pads				\$E\$197				
				Extender Screens				\$E\$197				
				Deskings Screens				\$E\$197				
				Fan Lights				\$E\$197	1 "FL"			
				places_fanlight		PLC			Inh			
				Modesty Panels				\$D\$157				
				places_convergent_modesty_panel		PLC			n/a	NOT IN PHASE I	n/a	NOT IN PHASE I
				places_corner_modesty_panel		PLC			n/a	NOT IN PHASE I	n/a	NOT IN PHASE I
				places_straight_modesty_panel		PLC						

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Relationship Maps (part 15 of 34)

Class Structure		Component Name	Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
		places_muntin_kit	PLC			1	Must attach to Places Glazed_Panels, matching its size		
		places_wainscot_kit	PLC			1	Must attach to Places Glazed_Panels, matching its size		
	Horizontals				\$C\$156				
	Work Surfaces			L	\$D\$214	1	"Hang Stuff" AND "Work Surfaces"	1	"Hang Stuff"
	Corner Work Surfaces				\$E\$215	1	Require "3-corner" support		
	Height Adjustable Corner Work Surfaces				\$F\$216				
	places_height_adjustable_corner_work_surface		PLC						
	places_height_adjustable_split_corner_work_surface		PLC						
	Regular Corner Work Surfaces				\$F\$216				
	premise_corner_work_surface		PRM			1	"RCorWS prm-cws"		
	premise_wrap_around_work_surface		PRM			1	"RCorWS prm-waws"		
	places_corner_work_surface		PLC						
	places_wrap_around_work_surface		PLC						
	Electronic Corner Work Surfaces						If 2 adjacent electronic WS are separated by 2" gap (i.e. they span a 3-way junction) they need 1 places_electronic_work_surface_tr ansition_cover between them		
	places_electronic_corner_work_surface		PLC		\$F\$216	1			

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Relationship Maps (part 16 of 34)

Class Structure				Inher-its		C#		Constraint Relationships		L#		Light Weight Relationships	
Component Name				Proper-ties		From		Relationships		Relationships		Relationships	
Transitional Corner Work Surfaces						\$F\$216		1 "TCWS prm-twaws"					
premise_transitional_wrap_around_work_surface	PRM												
places_transitional_corner_work_surface	PLC												
places_transitional_wrap_around_work_surface	PLC												
Rectangular Work Surfaces						\$E\$215							
Height Adjustable Rectangular Work Surfaces						\$F\$231							
places_height_adjustable_rectangular_work_surface	PLC												
Regular Rectangular Work Surfaces						\$F\$231		1 "RegRectWS"					
Premise Regular Rectangular Work Surfaces						\$G\$234		1 Premise Work Surfaces must have floor support every 5'					
premise_radused_rectangular_work_surface	PRM							1 "PRRWS prm-rws"					
premise_rectangular_work_surface	PRM							1 "PRRWS prm-rws"					
premise_split_rectangular_work_surface	PRM							1 "PRRWS prm-srws"					

Relationship Maps (part 17 of 34)

Class Structure				Component Name	Prod Line	Proper- ties	Inher- its	C#	Constraint	L#	Light Weight
							From	Relationships			Relationships
				<i>Places_Regular_Rectangular_Work Surfaces</i>							
				places_monitor_work_surface	PLC		\$G\$234				
				places_radiused_rectangular_work_surface	PLC						
				places_rectangular_work_surface	PLC						
				places_rectangular_work_surface_top	PLC						
				places_split_rectangular_work_surface	PLC						

Relationship Maps (part 18 of 34)

Class Structure	Component Name	Prod Line	Properties	Inherits	C#	Constraint Relationships	L#	Light Weight Relationships
	Electronic Rectangular Work Surfaces					If 2 adjacent electronic WS are separated by 2" gap (i.e. they span a 3-way junction) they need 1 places_electronic_work_surface_tr		
	places_electronic_rectangular_work_surface	PLC		\$F\$231	1	ansition_cover between them		
	Transitional Rectangular Work Surfaces							
	premise_transitional_rectangular_work_surface	PRM		\$F\$231	1	"TRWS prm-trws"		
	places_transitional_rectangular_work_surface	PLC						
	Convergent Work Surfaces					If Places, may mount to a panel up to six inches narrower than the convergent (panel run must be => than the width of the convergent)		
				\$E\$215	1			
	Regular Convergent Work Surfaces							
	premise_convergent_work_surface	PRM		\$F\$250	1	"RConvWS prm-cws"		
	places_convergent_work_surface	PLC			1	"RConvWS plc-cws"		
	Shaped Convergent Work Surfaces							
	premise_shaped_wrap_around_work_surface	PRM		\$F\$250	1	"SCWS prm-swaws"		
	places_shaped_wrap_around_work_surface	PLC						
	Conference Ends							
				\$E\$215				
	Regular Conference Ends					Attaches to 2 worksurfaces with panel between		
	premise_conference_end_work_surface	PRM		\$F\$257	1	"RCE prm-cws"		

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Relationship Maps (part 19 of 34)

Class Structure	Component Name	Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
	places_conference_end_work_surface	PLC						
	Single Run Conference Ends							
	premise_curved_work_surface	PRM		\$F\$257	1	"SRCE prm-cws"		
	premise_teardrop_end_work_surface	PRM			1	"SRCE prm-fews"		
	places_curved_work_surface	PLC						
	places_d_shaped_end_work_surface	PLC						
	places_teardrop_end_work_surface	PLC						
	Countertops			\$D\$214				
	Straight Countertops					Mounts on top of in-line panel run of uniform (<=53") height longer than the width of the counter top		
	premise_rectangular_counter_top	PRM		\$E\$267	1			
	places_rectangular_counter_top	PLC						
	places_wheelchair_reception_counter_top	PLC			1	Must be installed over two solid panels: 1) 48" counter over two 24" wide panels, 2) 60" counter over two 36" wide panels		

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Relationship Maps (part 20 of 34)

Class Structure		Component Name		Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
		Corner Countertops								
		places_corner_counter_top		PLC		\$E\$267	1	"CC plc-cct"		
		Horizontal Accessories								
		premise_keyboard_holders		PRM		\$D\$214				
		premise_mouse_pad		PRM						

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Relationship Maps (part 22 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher-its	C#	Constraint Relationships	L#	Light Weight Relationships
	new_views_base_cover_kit	PLC			???		???	
	places_180_connector_cover	PLC						
	places_90_connector_cover	PLC						
Connectors								
				\$D\$286	1	Must sit on floor		
T-Mount Kit						Cannot position the T-mount within		
				\$E\$299	1	.82" from end of panel	???	
	new_views_t_mount_bracket	PLC			inh			
Standard Connectors								
				\$E\$299				
	premise_connector	PRM				Must be as tall as the tallest panel		
	places_hinge	PLC			1	being joined		
Modesty Panel Supports								
				\$D\$286				
	places_modesty_to_cabinet_bracket	PLC						
	places_modesty_to_panel_bracket	PLC						
					n/a	NOT IN PHASE I	n/a	NOT IN PHASE I

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Relationship Maps (part 23 of 34)

Class Structure	Component Name	Prod Line	Properties	Inher-its	C#	Constraint Relationships	L#	Light Weight Relationships
Posts				From				
				\$D\$286				
Upper Posts				\$E\$308				
Lower Posts				\$E\$308				
Architectural Connections				\$D\$286				
Horizontal Supports				\$C\$156				
Table Bases				\$D\$312	1	Must sit on floor		

Relationship Maps (part 24 of 34)

Class Structure	Component Name	Prod Line	Properties	Inherits	C#	Constraint		Light Weight	
						Relationships	L#	Relationships	
Brackets				\$D\$312					
Panel Attached Brackets				\$E\$314					
			AF (when used in pairs)						
	premise_pedestal_to_panel_bracket	PRM							
	premise_work_surface_cantilever	PRM	AF		1	Unable to support 30" deep work surface with only cantilevers	n/a		
						The long side of the bracket must align to a Panel (i.e. bracket must "clip" to a panel)	n/a		
	premise_work_surface_corner_bracket	PRM	AF		1		n/a		
	places_included_work_surface_cantilever	PLC			n/a		n/a		
	places_work_surface_cantilever	PLC							
	places_work_surface_corner_bracket	PLC							
	places_work_surface_panel_mount	PLC							
	places_work_surface_side_mount	PLC							
	places_work_surface_slope_mount	PLC							
					n/a	NOT IN PHASE I	n/a	NOT IN PHASE I	
series_950_credenza_file_work_surface_support		PLC				required when cantilever in the way - use in place: provides aft support, credenza provides fore support			

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Relationship Maps (part 25 of 34)

Class Structure	Component Name	Prod Line	Properties	Inherits	C#	Constraint Relationships	L#	Light Weight Relationships
	Non-Panel Attached Brackets							
	premise_work_surface_drop_mount	PRM		\$E\$314				
	premise_work_surface_flush_mount	PRM						
	new_views_cabinet_to_work_surface_bracket	PLC				(brought in when NV Upper Dep Cabinet touches a WS)	n/a	
	places_work_surface_drop_mount	PLC						
	places_work_surface_flush_mount	PLC						
	Legs							
	premise_work_surface_support_leg	PRM		\$D\$312				
	places_work_surface_support_leg	PLC						
	Worksurface Support Panels							
	premise_work_surface_support_panel	PRM	AF, Acts as Return	\$D\$312	1	Must sit on floor		
	places_conference_end_support	PLC						
	places_work_surface_end_full_support_panel	PLC						
	places_work_surface_end_half_support_panel	PLC						
	places_work_surface_support_panel	PLC						

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Relationship Maps (part 26 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher-its	C#	Constraint Relationships	L#	Light Weight Relationships
	Height Adjustment Kits							
	premise_lateral_file_height_adjustment_kit	PRM		\$D\$312				
	premise_pedestal_height_adjustment_kit	PRM						
	premise_storage_unit_height_adjustment_kit	PRM						
	Adjustable Supports							
	places_height_adjustable_corner_mechanism	PLC		\$D\$312				

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Relationship Maps (part 27 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher-its	C#	Constraint Relationships	L#	Light Weight Relationships
	places_height_adjustable_rectangular_mechanism	PLC						
	places_height_adjustable_split_corner_mechanism	PLC						
Seating				\$A\$3	1	Must sit on floor		
	Auditorium Seating			\$B\$349				
	Adjustable Seating			\$B\$349				
	accolade_caster_base_chair	PLC						
	accolade_caster_base_stool	PLC						
	improv_caster_base_chair	PLC						
	improv_he_caster_base_chair	PLC						
	Stackable Seating			\$B\$349				
	improv_leg_base_stacking_chair	PLC						
	Non-Adjustable Seating			\$B\$349				
	accolade sled_base_chair	PLC						
	improv_leg_base_stool	PLC						
	improv_sled_base_chair	PLC						
	Lounge Seating			\$B\$349				
	Benches			\$C\$362				
	Single Lounge Seating			\$C\$362				
	Multiple Lounge Seating			\$C\$362				
Power and Data				\$A\$3				

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Relationship Maps (part 28 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
Power and Data Providers								
In-Feeds				\$B\$366				
				\$C\$367				
	premise_base_feed_module	PRM						
	premise_top_feed_module	PRM						
	places_base_feed_module	PLC						
	places_top_feed_module	PLC						
Out-Feeds								
				\$C\$367				
	premise_base_igr_receptacle	PRM						
						Require 1 of the 4 receptacle ports 1 on each panel	1	Snaps to receptacle port matching front/back and left/right, orientation same if front, 180 out if back
	premise_base_receptacle	PRM						
	premise_panel_communications_port_kit	PRM						
	premise_panel_power_port_kit	PRM			1 "OF prm-pppk"			
						requiresContainer(Raceway_Outlet 1), collocated and available	1	Snaps to Raceway_Outlet matching front/back and left/right, orientation same if front, 180 out if back
	places_base_igr_receptacle	PLC						
	places_base_igr_surge_protector_receptacle	PLC						
	places_base_receptacle	PLC						
	places_smart_work_surface_power_module	PLC						
	places_switching_system_kit	PLC			n/a	NOT IN PHASE I	n/a	NOT IN PHASE I
	places_switching_system_power_supply	PLC			n/a	NOT IN PHASE I	n/a	NOT IN PHASE I

Relationship Maps (part 29 of 34)

Class Structure	Component Name	Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
	places_switching_system_receptacle	PLC			n/a	NOT IN PHASE I	n/a	NOT IN PHASE I
	places_switching_system_wall_switch	PLC			n/a	NOT IN PHASE I	n/a	NOT IN PHASE I
	places_work_surface_duplex_receptacle	PLC			1	Requires a WS to sit on	1	Goes on top of WS at click_x, click_z
	places_work_surface_power_module	PLC						
Power and Data Routers								
				\$B\$366				
Power and Data Channels								
	premise_vertical_wire_manager	PRM		\$C\$388				
	places_cable_management_post	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_horizontal_wire_manager_33in	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_horizontal_wire_manager_40in	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_variable_height_cable_management_post	PLC						
Power and Data Connectors								
				\$C\$388	1	Consume 1 left- and 1 right-hand power site		
	premise_extended_power_connector	PRM			1	(used to span non-powered panels)		
	premise_flexible_power_connector	PRM						
	premise_straight_span_power_connector	PRM			1	Consume 1 left- and 1 right-hand power site		
	places_base_to_bellline_power_connector	PLC						
	places_bellline_to_bellline_power_connector	PLC						
	places_extended_power_connector	PLC						
	places_flexible_power_connector	PLC						
	places_straight_power_connector	PLC						
Cable Management								
				\$B\$366				
	premise_grommet	PRM						
	premise_wire_management_loop	PRM			n/a	ACCESSORY	n/a	ACCESSORY

Relationship Maps (part 31 of 34)

Class Structure	Component Name	Prod Line	Proper- ties	Inher- its	C#	Constraint Relationships	L#	Light Weight Relationships
	places_task_light	PLC			1	"HML plc-ll"		
Vertically Mounted Lighting								
	places_grid_hung_pivot_head_task_light	PLC		\$C\$416	n/a	ACCESSORY		ACCESSORY
	places_panel_hung_fluorescent_light	PLC			1	"Hang Stuff"		
	places_panel_hung_pivot_head_task_light	PLC			1	"Hang Stuff"		
	places_panel_mounted_fluorescent_light	PLC			1	"VML plc-pmfl"		
	places_post_mount_street_light	PLC			1	Mounts powered panels >=18" wide, <63" tall		
	places_street_light	PLC			1	"Mounts on Top of Panel" AND Panel >= 63"		
Floor Mounted Lighting								
				\$C\$416	1	Must sit on floor	1	If nothing selected, put at x_pos = click_global x, y_pos = 0, z_pos = click_global z, y_rot = 0
Lighting Accessories								
	places_fluorescent_light_saddle_mount_kit	PLC			1	Requires appropriate top-cap (wood or metal)	???	
	places_painted_shelf_task_light_bracket	PLC			*	(instantiated by premise_shelf)	*	
	places_vertical_storage_task_light_bracket	PLC			???		???	
	places_wood_shelf_task_light_bracket	PLC			*	(instantiated by premise_shelf)	*	
Organization								
				\$A\$3				
Tackable Surfaces								
	premise_tackboard	PRM	N	\$B\$437	1	"Tackables"	1	"Hang Stuff"
	places_grid_tackstrip	PLC	N		n/a	ACCESSORY	n/a	ACCESSORY
	places_tackboard	PLC	N		Inh		Inh	
Markable Surfaces								
				\$B\$437	1	"Markables"	1	"Hang Stuff"

Relationship Maps (part 32 of 34)

Class Structure	Component Name	Prod Line	Properties	Inherits	Constraint		Light Weight
					C#	Relationships	
	premise_markerboard	PRM	N		Inh		Inh
	places_markerboard	PLC	N		Inh		Inh
				\$B\$437			
Workflow Devices							
				\$C\$445			
Vertical Workflows							
	premise_all_purpose_hook	PRM			n/a	ACCESSORY	n/a
	premise_lateral_file_drawer_compressor	PRM			n/a	ACCESSORY	n/a
	premise_lateral_file_drawer_divider	PRM			n/a	ACCESSORY	n/a
	premise_lateral_file_front_to_back_hanging_bar	PRM			n/a	ACCESSORY	n/a
	premise_lateral_file_side_to_side_hanging_bar	PRM			n/a	ACCESSORY	n/a
	premise_pedestal_drawer_divider	PRM			n/a	ACCESSORY	n/a
	premise_shelf_divider	PRM			n/a	ACCESSORY	n/a
	paper_management_bar_C, PRM				n/a	ACCESSORY	n/a
	paper_management_freestanding_vertical_unit_C, PRM				n/a	ACCESSORY	n/a
	paper_management_suspended_vertical_unit_C, PRM				n/a	ACCESSORY	n/a
	new_views_shelf_divider	PLC			n/a	ACCESSORY	n/a
	places_all_purpose_hook	PLC			n/a	ACCESSORY	n/a
	places_fundamental_pedestal_hanging_bar	PLC			n/a	ACCESSORY	n/a
	places_fundamental_pedestal_side_to_side_divider	PLC			n/a	ACCESSORY	n/a
	places_lateral_file_front_to_back_hanging_bar	PLC			n/a	ACCESSORY	n/a
	places_organization_grid	PLC			n/a	ACCESSORY	n/a

Relationship Maps (part 33 of 34)

Class Structure	Component Name	Prod Line	Proper ties	Inher-its	Constraint		Light Weight	
					C#	Relationships	L#	Relationships
	places_shelf_divider	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_vertical_storage_unit_grid	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	tri_mode_paper_management_bar	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	tri_mode_vertical_unit	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	series_950_drawer_compressor	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	series_950_drawer_divider	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	series_950_front_to_back_hanging_bar	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	series_950_side_to_side_hanging_bar	PLC			n/a	ACCESSORY	n/a	ACCESSORY
Horizontal Workflows								
	premise_pedestal_pencil_tray	PRM		\$C\$445				
	paper_management_freestanding_horizontal_unit_C, PRM				n/a	ACCESSORY	n/a	ACCESSORY
	paper_management_suspended_horizontal_unit_C, PRM				n/a	ACCESSORY	n/a	ACCESSORY
	paper_management_under_shelf_unit_C, PRM				n/a	ACCESSORY	n/a	ACCESSORY
	paper_management_under_shelf_unit	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_freestanding_grid_mailbox	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_fundamental_pedestal_tray	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_grid_mailbox	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	places_grid_reference_tray	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	tri_mode_divider	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	tri_mode_hanger_clip	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	tri_mode_horizontal_shelves	PLC			n/a	ACCESSORY	n/a	ACCESSORY
	tri_mode_horizontal_unit	PLC			n/a	ACCESSORY	n/a	ACCESSORY

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Relationship Maps (part 34 of 34)

Class Structure	Component Name	Prod Line	Proper- ties	Inher- its	Constraint		Light Weight	
					Relationships	C#	Relationships	L#
Diagonal Workflows								
	paper_management_freestanding_diagonal_unit	LC, PRM		\$C\$445	ACCESSORY	n/a	ACCESSORY	n/a
	paper_management_suspended_diagonal_unit	LC, PRM			ACCESSORY	n/a	ACCESSORY	n/a
	tri_mode_diagonal_unit	PLC			ACCESSORY	n/a	ACCESSORY	n/a
Workflow Bins								
	places_grid_diskette_bin	PLC		\$C\$445	ACCESSORY	n/a	ACCESSORY	n/a
	places_grid_storage_bin	PLC			ACCESSORY	n/a	ACCESSORY	n/a

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Although described with reference to a particular system, the present invention operates on any computer system and can be implemented in software, hardware or any combination thereof. When implemented fully or
5 partially in software, the invention can reside, permanently or temporarily, on any memory or storage medium, including but not limited to a RAM, a ROM, a disk, an ASIC, a PROM and the like.

Thus, a graphical user interface for configuring
10 office furniture is provided. One skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which are presented for purposes of illustration and not limitation, and the present invention is limited
15 only by the claims that follow.

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What is claimed:

- 1 1. A method, for use in a user workstation
2 including a pointing device and a visual display unit,
3 for providing a graphical user interface to a computer
4 program for configuring office furniture, the method
5 comprising:
6 displaying on a screen of the visual display unit
7 at the user's workstation questions regarding user
8 configuration criteria;
9 in response to said displaying, obtaining
10 configuration criteria from the user and providing the
11 user configuration criteria to the computer program;
12 displaying in an area on a screen of the visual
13 display unit at the user's workstation a graphical
14 representation of at least one typical furniture
15 configuration satisfying the user configuration
16 criteria;
17 selecting, with the pointing device, a typical
18 furniture configuration from the at least one typical
19 furniture configuration displayed on the screen;
20 modifying, using the pointing device, aspects of
21 the selected typical furniture configuration to produce
22 a modified furniture configuration;

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23 displaying on the visual display unit at the
24 user's workstation a graphical representation of the
25 modified furniture configuration;
26 with the pointing device, selecting a validity
27 checking option to effect checking the validity of the
28 modified furniture configuration; and
29 in response to said selecting the validity
30 checking option, checking the validity of the modified
31 configuration.

1 2. A method as in claim 1 wherein the
2 configuration criteria include at least one of:
3 conferencing criteria;
4 privacy criteria;
5 power criteria;
6 communications criteria;
7 storage criteria; and
8 area criteria.

1 3. A method as in claim 1 wherein the modifying
2 of the selected typical furniture configuration
3 comprises at least one of, for a depicted component of
4 the selected typical furniture configuration:
5 adding another component to the depiction of the
6 selected typical furniture configuration;

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7 deleting the depicted component from the depiction
8 of selected typical furniture configuration;
9 repositioning the depicted component of the
10 depicted selected typical furniture configuration;
11 changing the depicted fabric or finish of the
12 depicted component of the depicted selected typical
13 furniture configuration; and
14 changing the shape or size of the depicted
15 component of the depicted selected typical furniture
16 configuration.

1 4. A method as in claim 3 wherein the adding of
2 another component comprises:

3 on the screen of the visual display unit at the
4 user's workstation, presenting the user with various
5 possible components which can be added; and

6 by the user,

7 selecting with the pointing device one of the
8 various possible components; and
9 on the display depicting the typical
10 furniture configuration, positioning the
11 selected one possible component on the
12 depiction of the current typical furniture
13 configuration.

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1 5. A method as in claim 3 wherein the changing
2 the shape or size of the depicted component comprises,
3 with the pointing device:

4 selecting the depicted component; and
5 adjusting the shape or size of the depicted
6 component, whereby the shape or size can only be
7 adjusted to a valid shape or size.

1 6. A method as in claim 1 further comprising:
2 with the pointing device, selecting a price option
3 to effect determining a price of the modified
4 configuration; and
5 in response to said selecting said price option,
6 determining a price of the modified depicted
7 configuration.

1 7. A method as in claim 1 further comprising:
2 with the pointing device, selecting a cluster
3 option to effect producing a cluster configuration of
4 the modified typical furniture configuration; and
5 in response to said selecting said cluster option,
6 producing a cluster configuration of the modified
7 typical furniture configuration; and
8 displaying on the screen of the visual display
9 unit at the user's workstation a depiction of the
10 cluster configuration.

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1 8. A method as in claim 7 further comprising:
2 with the pointing device, selecting a price option
3 to effect determining a price of the cluster
4 configuration; and
5 in response to said selecting said price option,
6 determining the price of the cluster configuration.

1 9. A method as in claim 7 wherein the producing
2 of a cluster comprises:
3 determining if the cluster configuration is a
4 valid configuration; and
5 optimizing the cluster configuration.

1 10. A method as in claim 1 wherein the checking
2 the validity of the modified configuration comprises
3 optimizing the modified configuration.

1 11. A method as in claims 9 or 10 wherein the
2 optimizing of a configuration comprises at least one
3 of:
4 removing redundant components from the
5 configuration;
6 merging components in the configuration; and
7 splitting components in the configuration.

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1 12. A method as in claim 1 wherein the modifying
2 aspects of the selected typical furniture configuration
3 comprises modifying the entire product line of the
4 configuration.

1 13. A method of configuring office furniture
2 comprising, by computer:
3 obtaining configuration criteria from a user;
4 presenting the user with at least one typical
5 furniture configuration satisfying the criteria;
6 selecting a typical furniture configuration from
7 the at least one typical configuration;
8 modifying aspects of the selected typical
9 furniture configuration to produce a modified furniture
10 configuration;
11 producing a cluster configuration of the modified
12 typical furniture configuration;
13 checking the validity of the cluster
14 configuration; and
15 determining a price of the cluster configuration.

1 14. A method of configuring office furniture
2 comprising, by computer:
3 obtaining configuration criteria from a user;
4 presenting the user with at least one typical
5 furniture configuration satisfying the criteria;

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6 selecting a typical furniture configuration from
7 the at least one typical configuration;
8 modifying aspects of the selected typical
9 furniture configuration to produce a modified
10 configuration; and
11 checking the validity of the modified
12 configuration.

1 15. A method as in claim 14 wherein the
2 configuration criteria include at least one of:
3 conferencing criteria;
4 privacy criteria;
5 power criteria;
6 communications criteria;
7 storage criteria; and
8 area criteria.

1 16. A method as in claim 14 wherein the modifying
2 of the selected typical comprises at least one of, for
3 a component of the selected typical:
4 adding another component to the selected typical
5 furniture configuration;
6 deleting the component from the selected typical
7 furniture configuration;
8 repositioning the component of the selected
9 typical furniture configuration;

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10 changing the fabric or finish of the component of
11 the selected typical furniture configuration; and
12 changing the shape or size of the component of the
13 selected typical furniture configuration.

1 17. A method as in claim 16 wherein the adding of
2 another component comprises:
3 presenting the user with possible components which
4 can be added; and
5 by the user,
6 selecting one of the possible components; and
7 positioning the selected one possible
8 component on the current typical furniture
9 configuration.

1 18. A method as in claim 16 wherein the changing
2 the shape or size of the component comprises:
3 selecting the component; and
4 adjusting the shape or size of the component,
5 whereby the shape or size can only be adjusted to a
6 valid shape or size.

1 19. A method as in claim 14 further comprising:
2 determining a price of the modified furniture
3 configuration.

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1 20. A method as in claim 14 further comprising:
2 producing a cluster configuration of the modified
3 typical furniture configuration.

1 21. A method as in claim 20 further comprising:
2 determining a price of the cluster configuration.

1 22. A method as in claim 20 wherein the producing
2 of a cluster comprises:
3 determining if the cluster configuration is a
4 valid configuration;
5 optimizing the cluster configuration.

1 23. A method as in claim 14 wherein the
2 checking the validity of the modified furniture
3 configuration comprises
4 optimizing the modified furniture configuration.

1 24. A method as in any one of claims 22 and 23
2 wherein the optimizing of a configuration comprises at
3 least one of:
4 removing redundant components from the
5 configuration;
6 merging components in the configuration; and
7 splitting components in the configuration.

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1 25. A method as in claim 14 wherein the modifying
2 aspects of the selected typical comprises modifying the
3 entire product line of the configuration.

1 26. Computer-readable media tangibly embodying an
2 interface program of instructions executable by the
3 machine to provide a graphical user interface to a
4 computer program for configuring office furniture, the
5 interface program comprising code to effect:

6 displaying on a screen of a visual display unit at
7 a user's workstation questions regarding user
8 configuration criteria;

9 in response to said displaying, obtaining
10 configuration criteria from the user;

11 displaying in an area on a screen of the visual
12 display unit at the user's workstation a graphical
13 representation of at least one typical furniture
14 configuration satisfying the criteria;

15 selecting, with input from the pointing device, a
16 typical furniture configuration from the at least one
17 typical furniture configurations displayed on the
18 screen;

19 modifying, using input from the pointing device,
20 aspects of the selected typical furniture configuration
21 to produce a modified furniture configuration;

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22 displaying on the visual display unit at the
23 user's workstation a graphical representation of the
24 modified furniture configuration;

25 with input from the pointing device, selecting a
26 validity checking option to effect checking the
27 validity of the modified furniture configuration; and

28 in response to said selecting the validity
29 checking option, checking the validity of the modified
30 furniture configuration.

1 27. Media as in claim 26 wherein the
2 configuration criteria include at least one of:

3 conferencing criteria;
4 privacy criteria;
5 power criteria;
6 communications criteria;
7 storage criteria; and
8 area criteria.

1 28. Media as in claim 26 wherein the modifying of
2 the selected typical comprises at least one of, for a
3 depicted component of the selected typical furniture
4 configuration:

5 adding another component to the depiction of the
6 selected typical furniture configuration;

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7 deleting the depicted component from the depiction
8 of selected typical furniture configuration;
9 repositioning the depicted component of the
10 depicted selected typical furniture configuration;
11 changing the depicted fabric or finish of the
12 depicted component of the depicted selected typical
13 furniture configuration; and
14 changing the shape or size of the depicted
15 component of the depicted selected typical furniture
16 configuration.

1 29. Media as in claim 28 wherein the adding of
2 another component comprises:

3 on the screen of the visual display unit at the
4 user's workstation, presenting the user with various
5 possible components which can be added; and

6 by the user,

7 selecting with the pointing device one of the
8 various possible components; and
9 on the display depicting the typical
10 furniture configuration, positioning the
11 selected one possible component on the
12 depiction of the current typical furniture
13 configuration.

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1 30. Media as in claim 28 wherein the changing the
2 shape or size of the depicted component comprises, with
3 input from the pointing device:

4 selecting the depicted component; and
5 adjusting the shape or size of the depicted
6 component, whereby the shape or size can only be
7 adjusted to a valid shape or size.

1 31. Media as in claim 26 the program further
2 comprising code to effect:

3 with input from the pointing device, selecting a
4 price option to effect determining a price of the
5 modified configuration; and

6 in response to said selecting said price option,
7 determining a price of the modified depicted
8 configuration.

1 32. Media as in claim 26 the program further
2 comprising code to effect:

3 with input from the pointing device, selecting a
4 cluster option to effect producing a cluster
5 configuration of the modified typical furniture
6 configuration;

7 in response to said selecting said cluster option,
8 producing a cluster configuration of the modified
9 typical furniture configuration; and

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10 displaying on the screen of the visual display
11 unit at the user's workstation a depiction of the
12 cluster configuration.

1 33. Media as in claim 32, the program further
2 comprising code to effect:
3 with input from the pointing device, selecting a
4 price option to effect determining a price of the
5 modified configuration; and
6 in response to said selecting said price option,
7 determining the price of the cluster configuration.

1 34. Media as in claim 32 wherein the producing of
2 a cluster comprises:
3 determining if the cluster configuration is a
4 valid furniture configuration; and
5 optimizing the cluster configuration.

1 35. Media as in claim 26 wherein the checking the
2 validity of the modified configuration comprises
3 optimizing the modified configuration.

1 36. Media as in claim 35 wherein the optimizing
2 of a configuration comprises at least one of:
3 removing redundant components from the
4 configuration;

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5 merging components in the configuration; and
6 splitting components in the configuration.

1 37. Media as in claim 34 wherein the optimizing
2 of a configuration comprises at least one of:
3 removing redundant components from the
4 configuration;

5 merging components in the configuration; and
6 splitting components in the configuration.

1 38. Media as in claim 26 wherein the modifying
2 aspects of the selected typical comprises modifying the
3 entire product line of the configuration.

1 39. Computer-readable media as in any one of
2 claims 26 to 38 wherein said media comprise at least
3 one of a RAM, a ROM, a disk, an ASIC and a PROM.

1 40. A computer-assisted furniture configuration
2 system comprising:

3 (A) a visual display unit;
4 (B) a pointing device; and
5 (C) interface means for providing a graphical
6 user interface to said configuration system, the
7 interface means comprising means to effect:

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8 displaying on a screen of the visual display unit
9 at the user's workstation questions regarding user
10 configuration criteria;

11 in response to said displaying, obtaining
12 configuration criteria from the user and providing the
13 user configuration criteria to the computer program;

14 displaying in an area on a screen of the visual
15 display unit at the user's workstation a graphical
16 representation of at least one typical furniture
17 configuration satisfying the user configuration
18 criteria;

19 selecting, with the pointing device, a typical
20 furniture configuration from the at least one typical
21 furniture configurations displayed on the screen;

22 modifying, using the pointing device, aspects of
23 the selected typical furniture configuration to produce
24 a modified furniture configuration;

25 displaying on the visual display unit at the
26 user's workstation a graphical representation of the
27 modified furniture configuration;

28 with the pointing device, selecting a validity
29 checking option to effect checking the validity of the
30 modified furniture configuration; and

31 in response to said selecting the validity
32 checking option, checking the validity of the modified
33 configuration.

FIG. 1

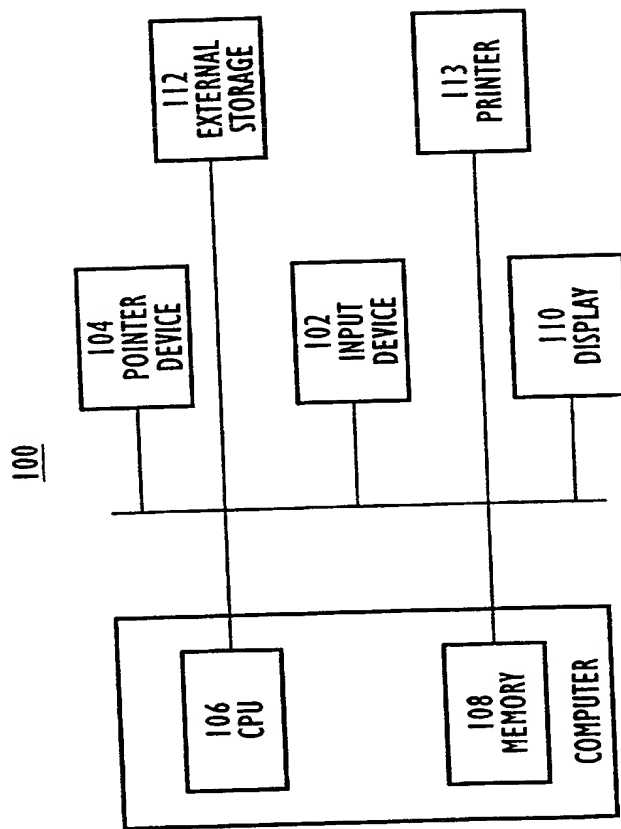


FIG. 2

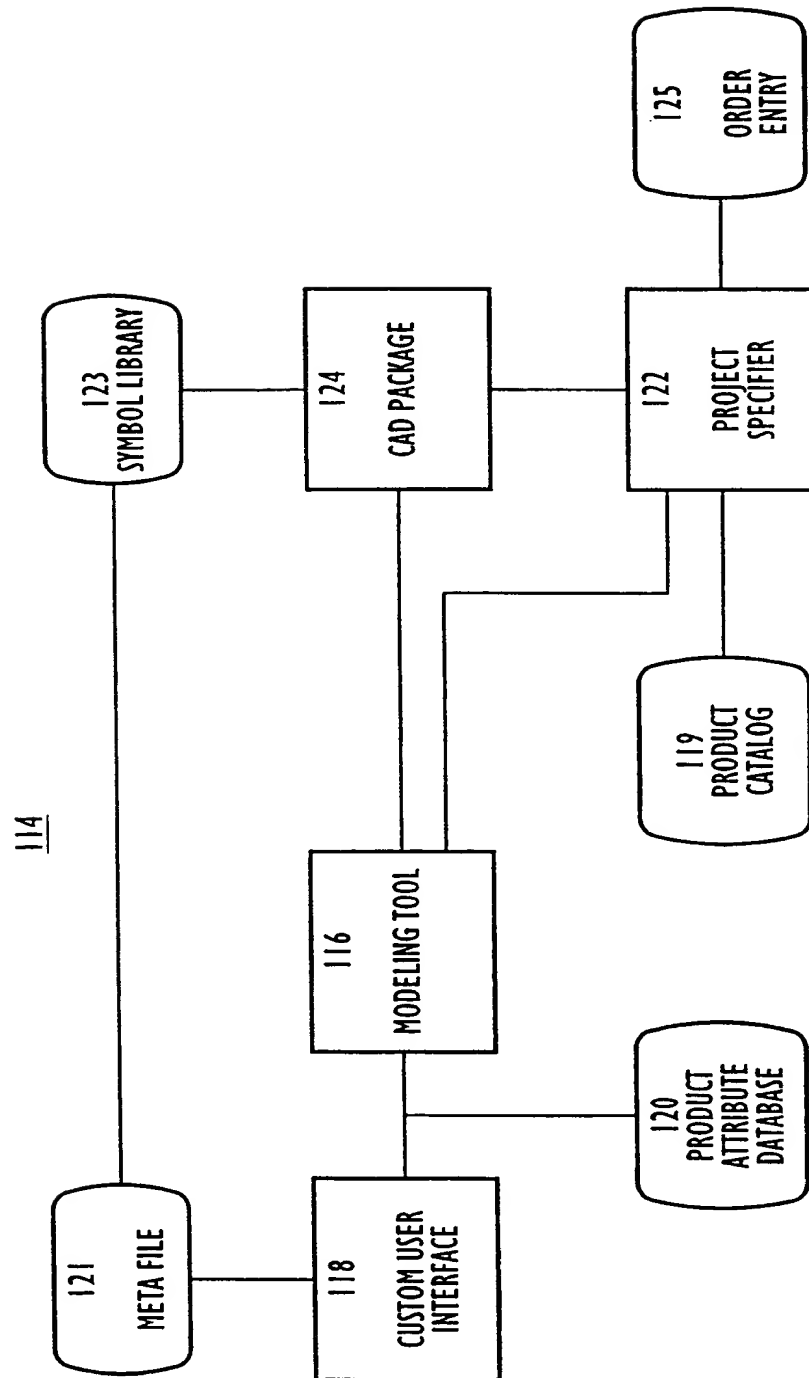
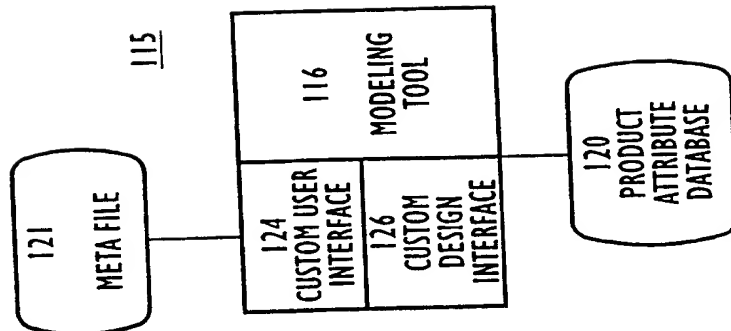
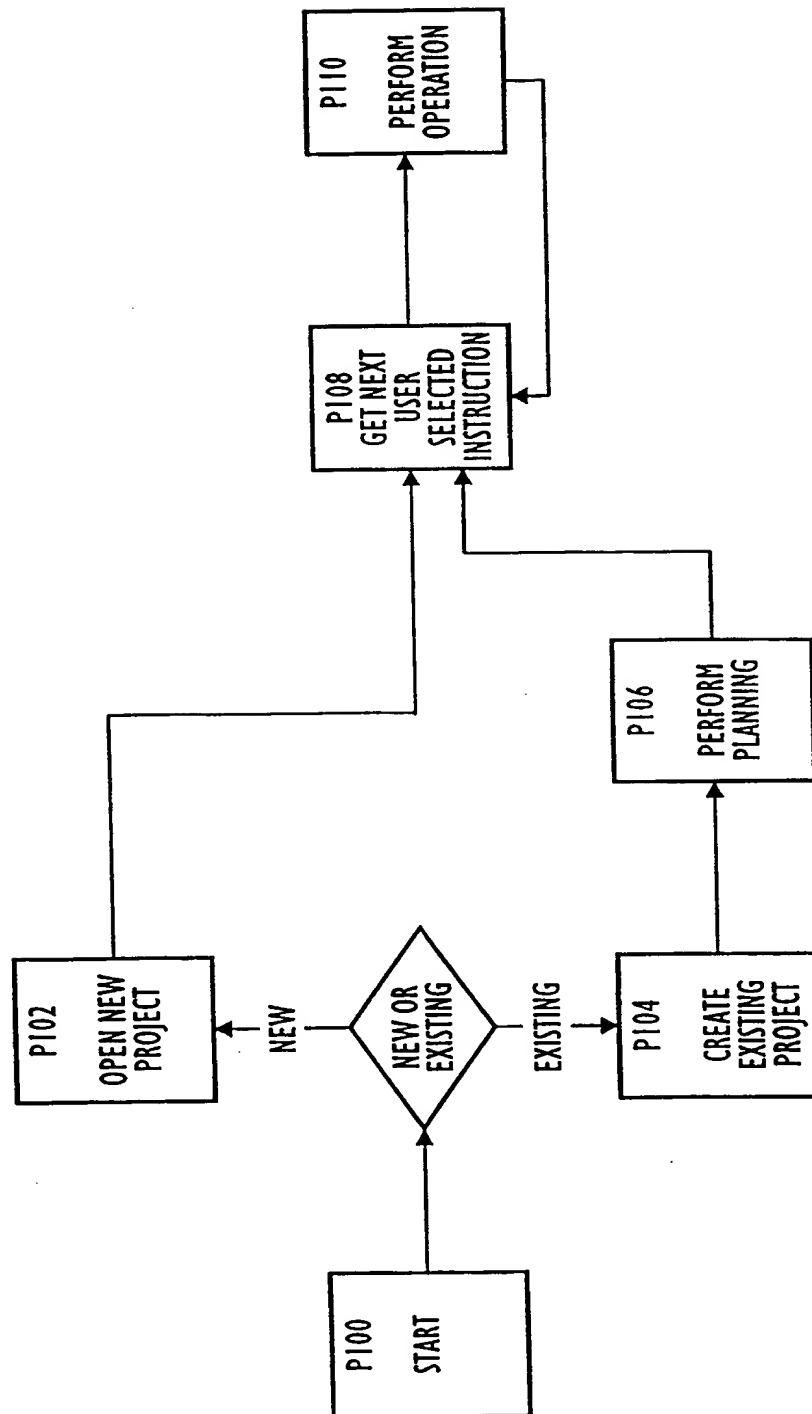


FIG. 3



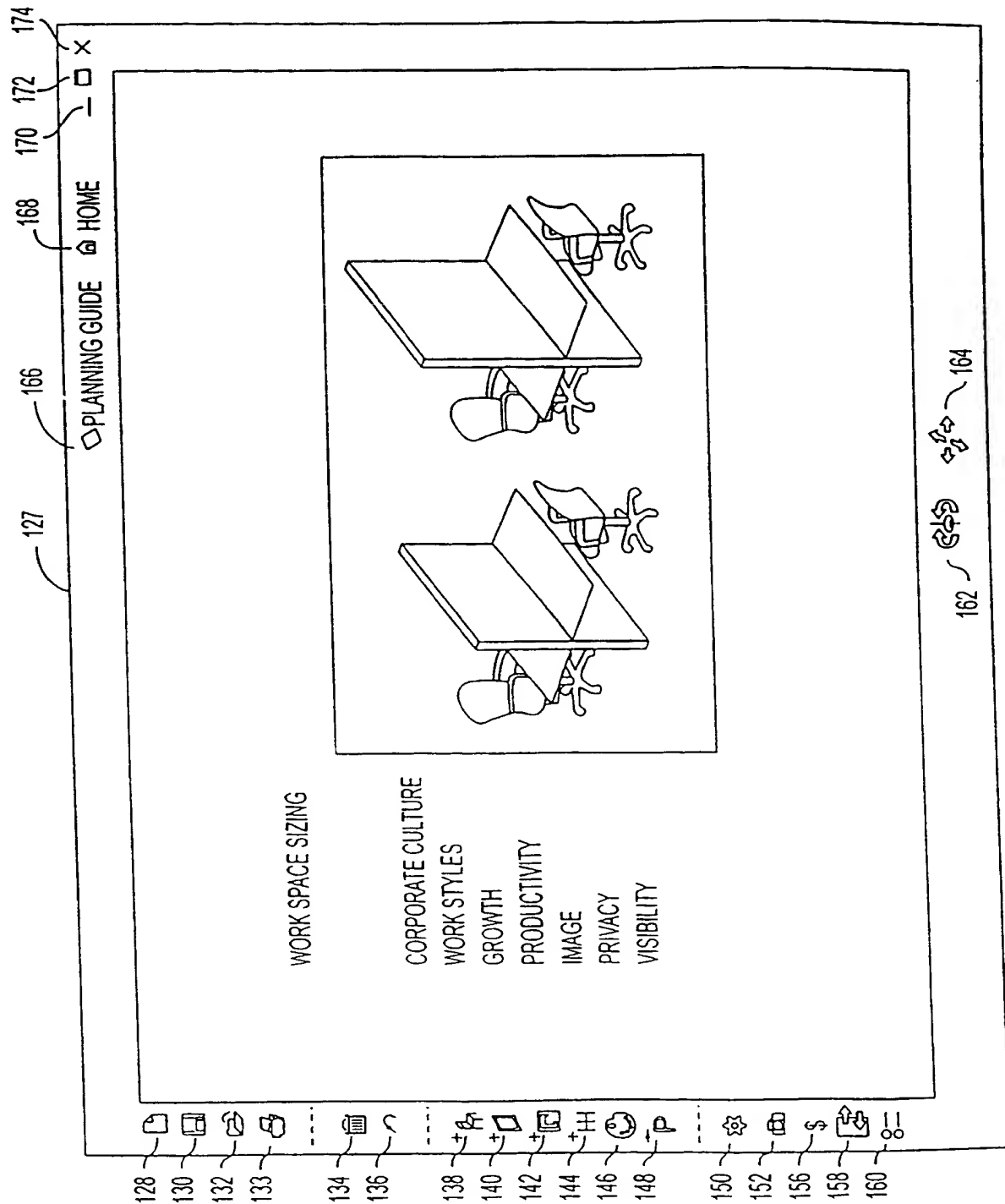
4/15

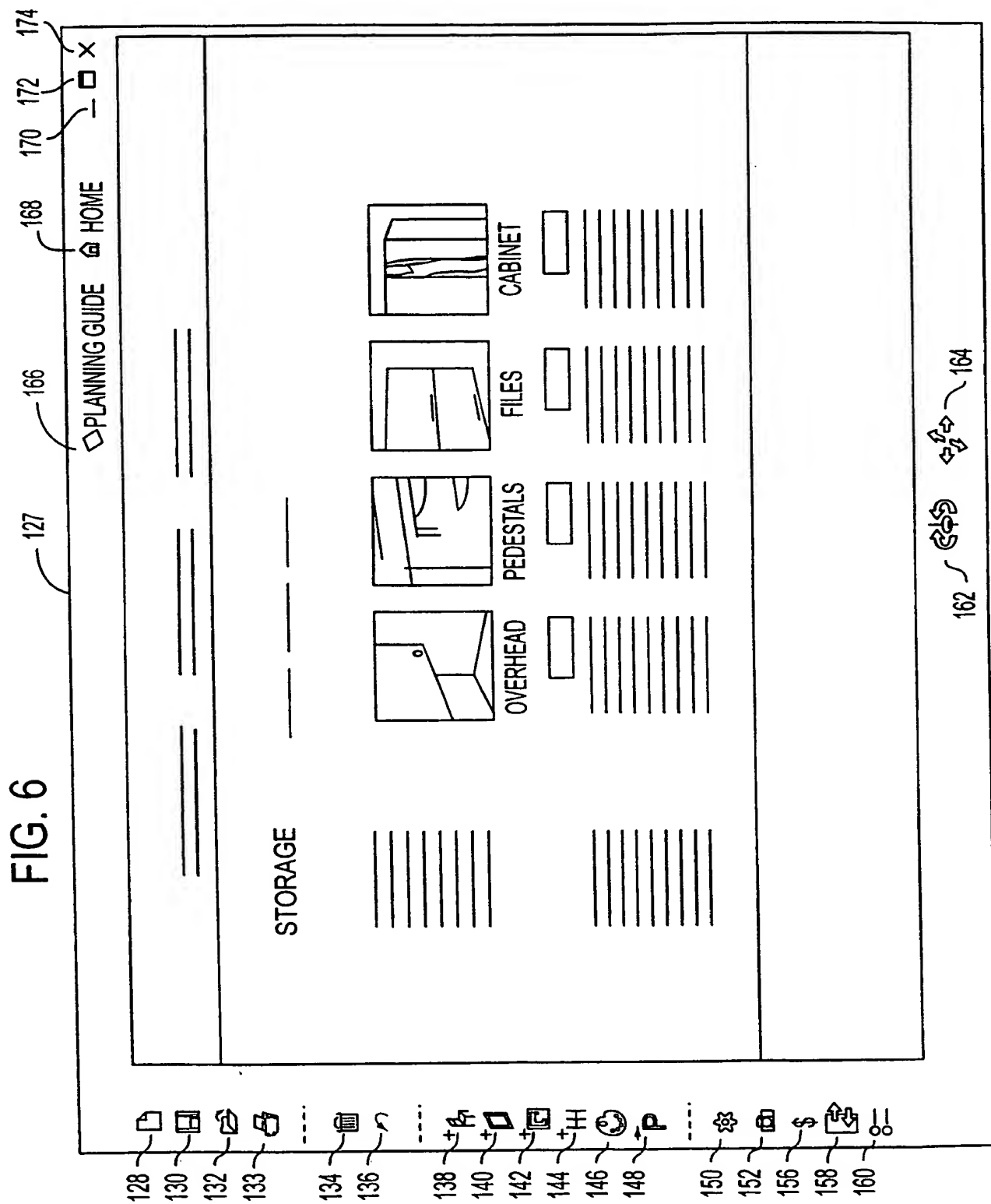
FIG. 4



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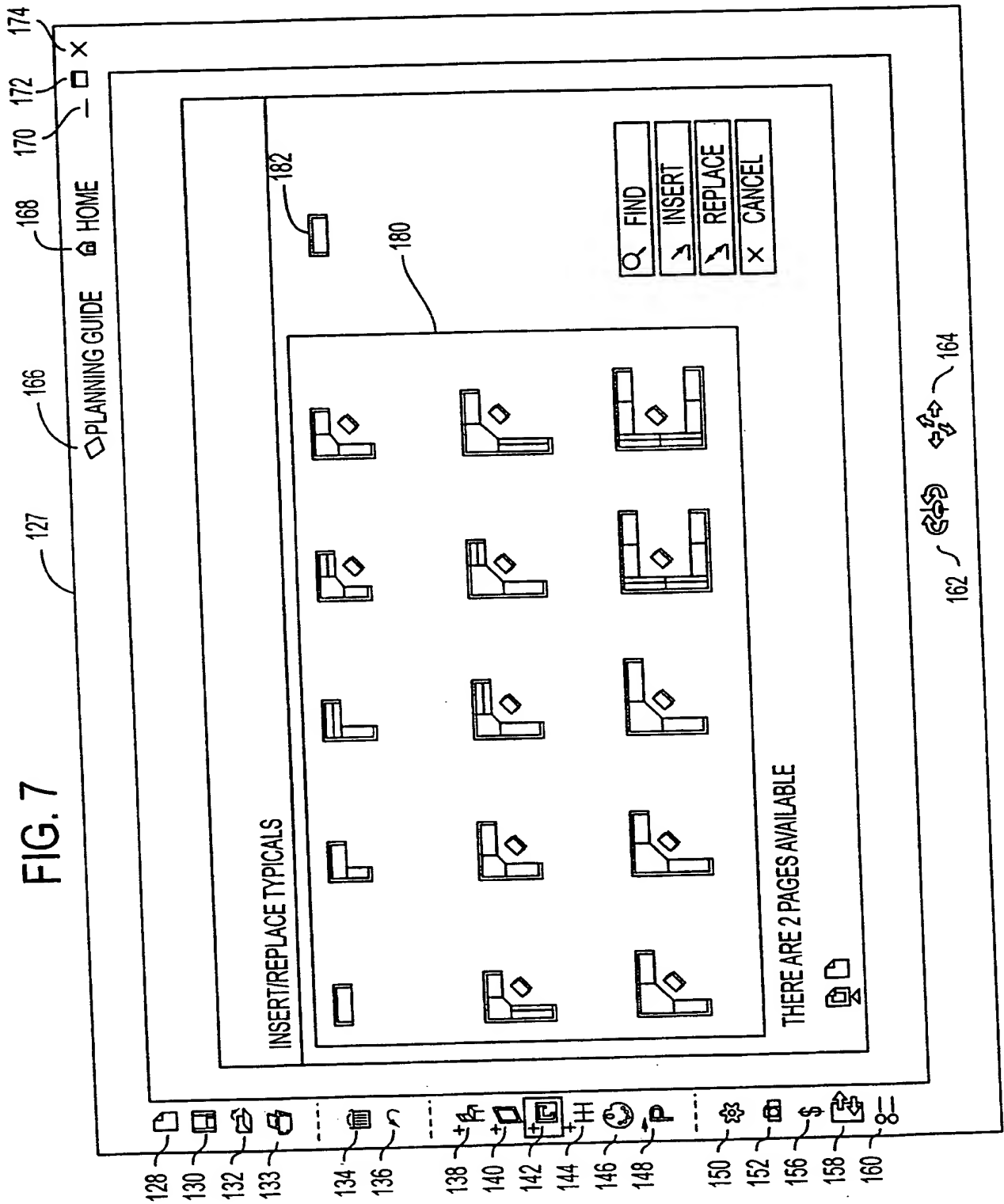
FIG. 5





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FIG. 7



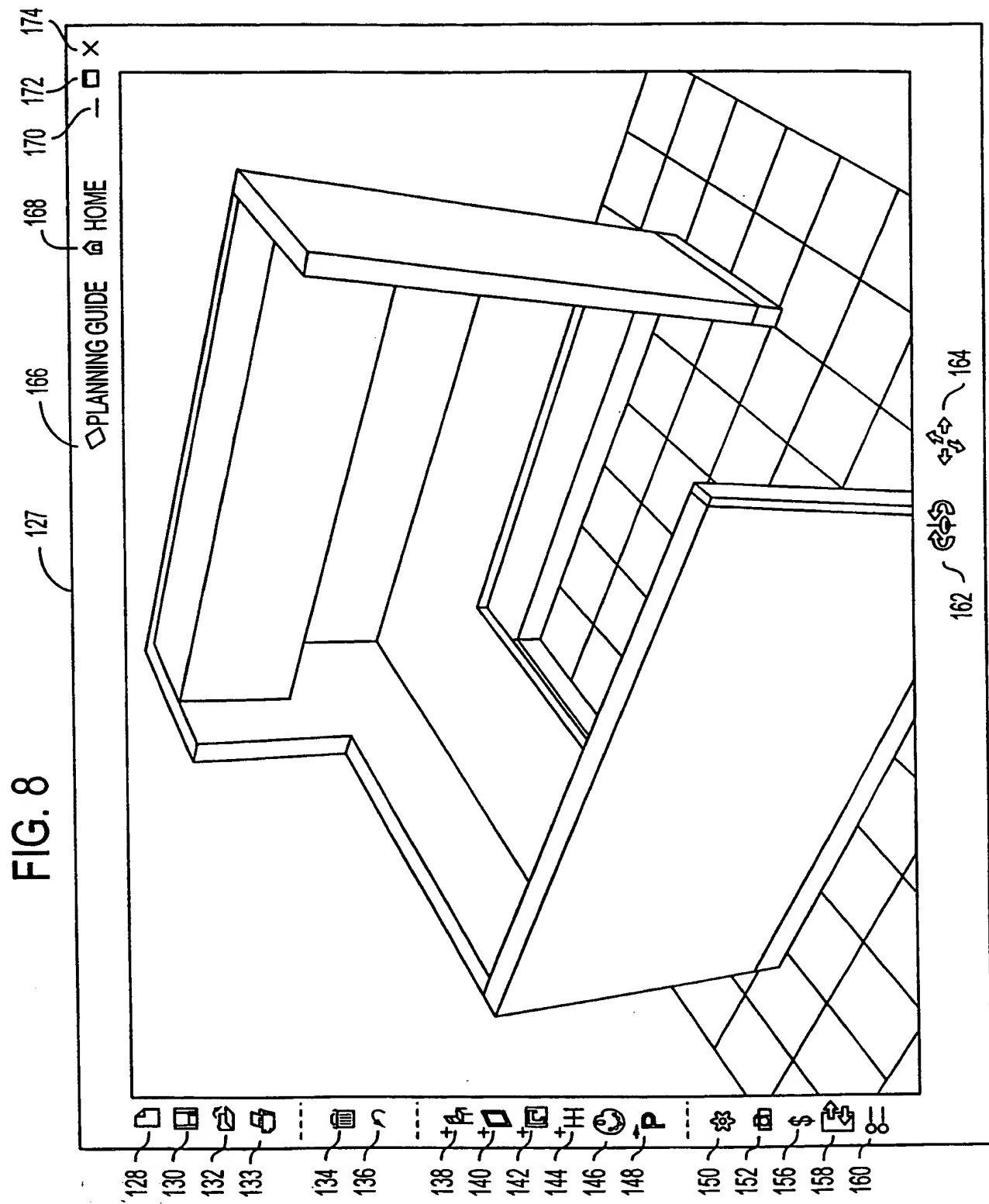
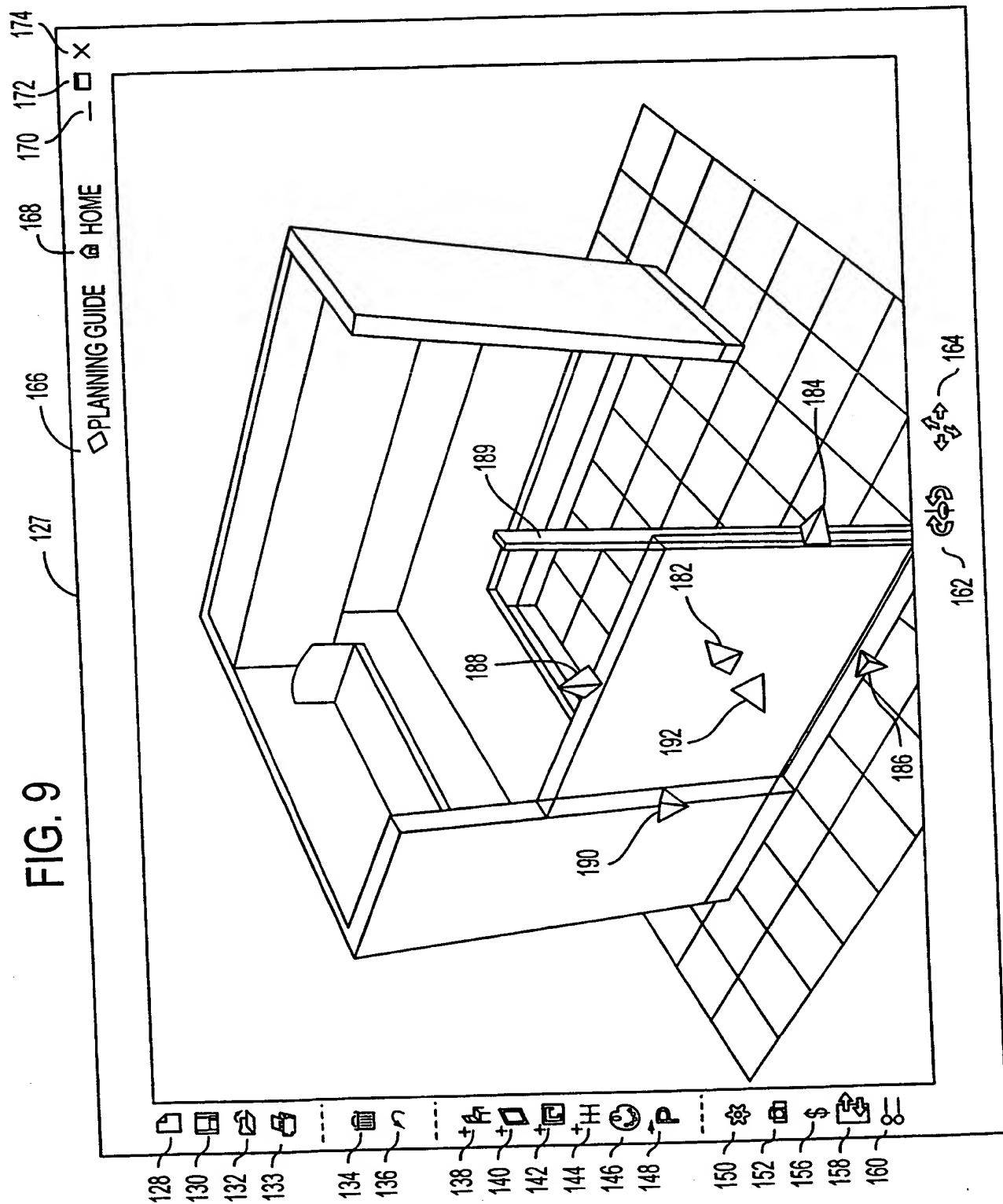
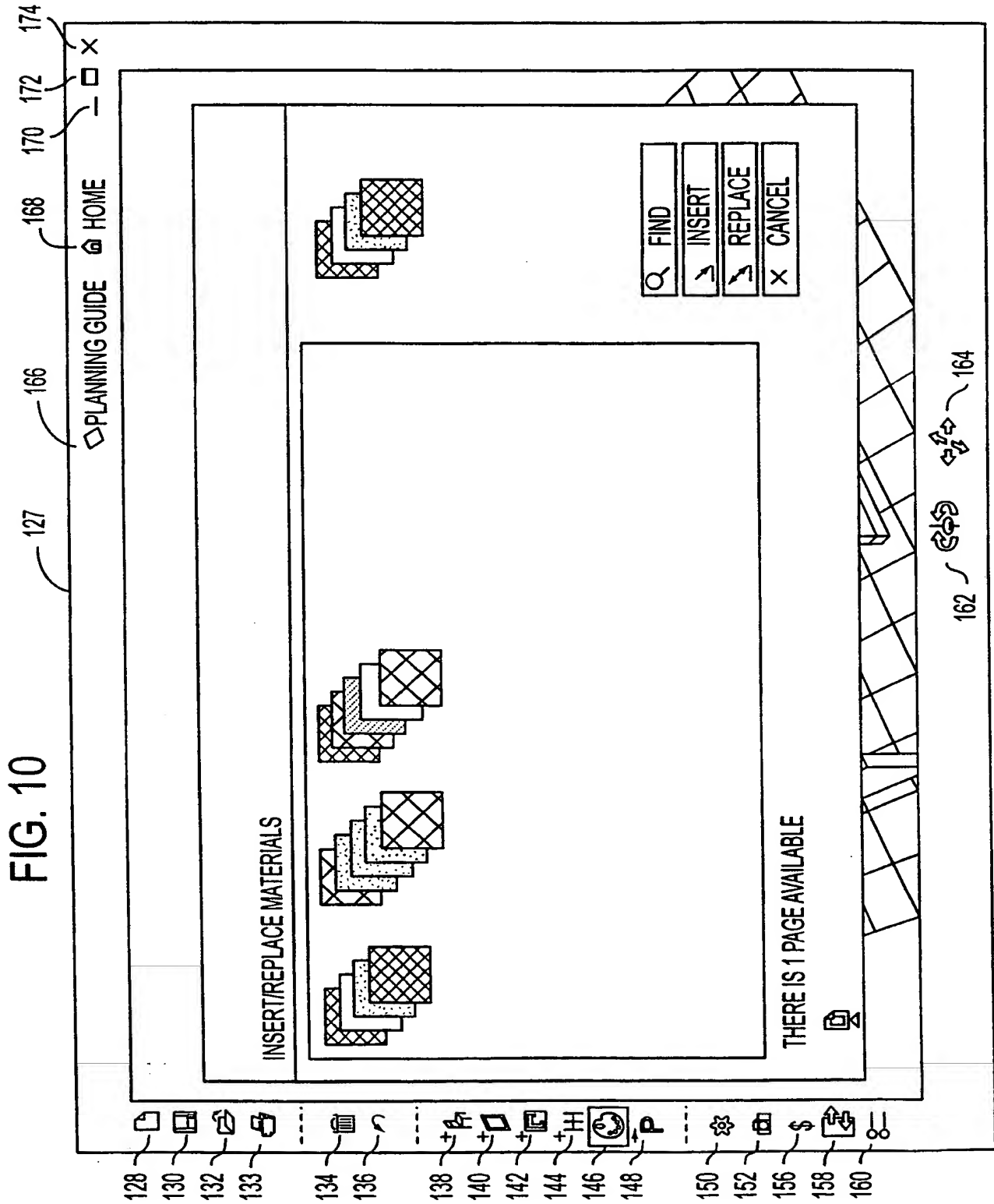


FIG. 9





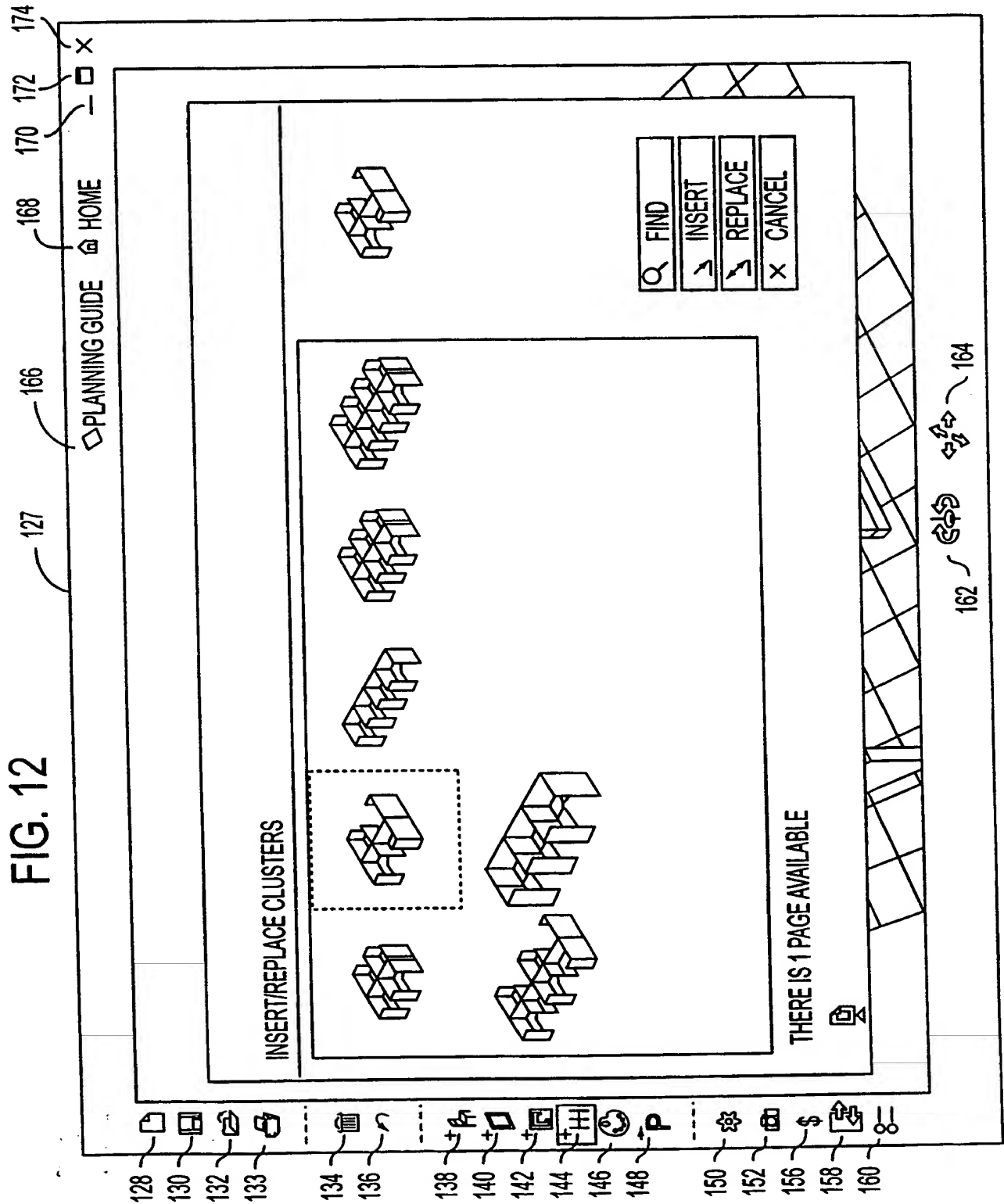


FIG. 13

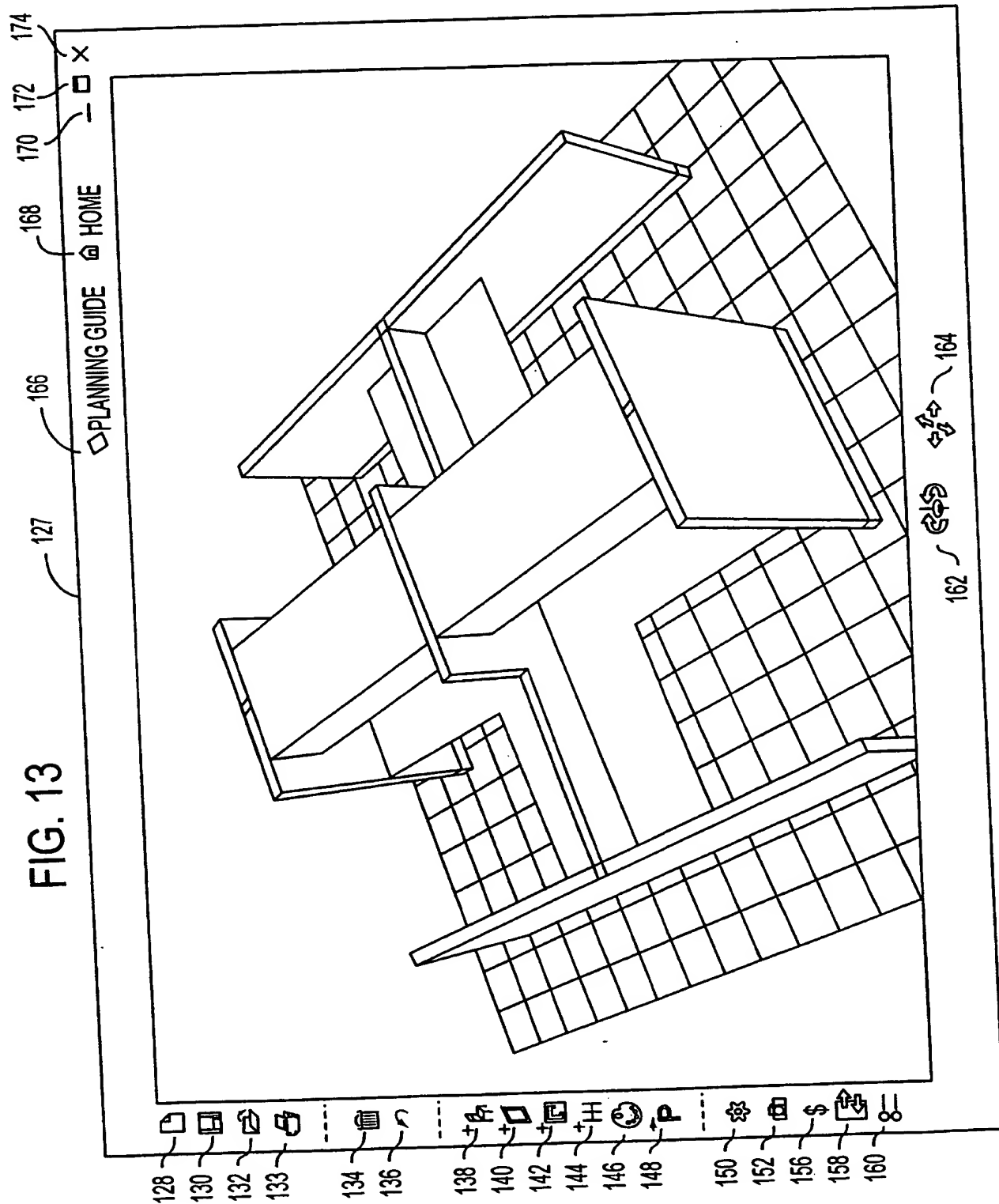
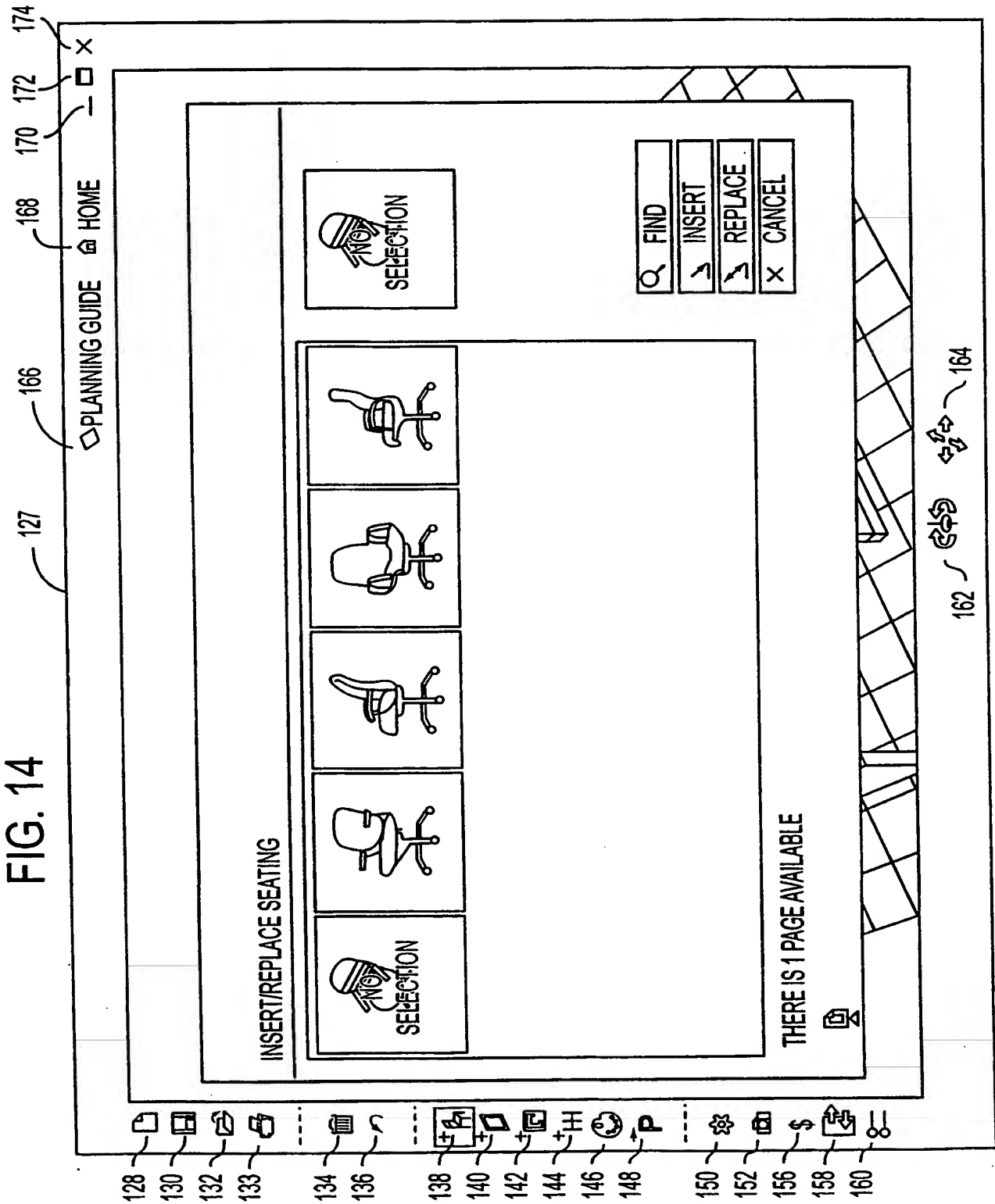


FIG. 14



15/15

FIG. 15

128 130 132 133 134 136 138 140 142 144 146 148 150 152 156 158 160

127 166 168 170 172 174

PLANNING GUIDE HOME X

QUOTE BILL OF MATERIALS

COMPONENT	SIZE	QTY	BASE PART NU...	LIST	DISC.	EXT. \$	DEALER%	COST	MARGIN\$	MARG%
CURRENT PROJECT										
PANEL	64x24	3	NPFW-6424-PF...	\$508.00	0%	\$1524.00	40%	\$609.60	\$914.40	250%
PANEL	64x36	2	NPFW-6436-PF...	\$611.00	0%	\$1222.00	40%	\$488.80	\$733.20	250%
PANEL	64x48	2	NPFW-6448-PF...	\$702.00	0%	\$1404.00	40%	\$561.60	\$842.40	250%
FJ-OAH										
FE-OC7										
TR-00E										
VP-00N										
BRACKET	0	4	NSC-1,TR-00K	\$37.00	0%	\$148.00	40%	\$59.20	\$88.80	250%
BRACKET	0	2	NUDS-15,TR-00R	\$37.00	0%	\$74.00	40%	\$29.60	\$44.40	250%
BRACKET	0	1	NUSS-10,TR-00R	\$37.00	0%	\$37.00	40%	\$14.80	\$22.20	250%
CONNECTOR	64	3	NV2W-64-F,TR-	\$161.00	0%	\$483.00	40%	\$193.20	\$289.80	250%
COVER	64	2	NVEW-64-F,TR-	\$82.00	0%	\$164.00	40%	\$65.60	\$98.40	250%
CONNECTOR	64	3	NVSS-64	\$35.00	0%	\$105.00	40%	\$42.00	\$63.00	250%
WORK SURFACE	24x48	1	NWRW-2448,VP...	\$452.00	0%	\$452.00	40%	\$180.80	\$271.20	250%
VP-00N										
WORK SURFACE	24x72	1	NWRW-2472,VP	\$576.00	0%	\$576.00	40%	\$230.40	\$345.60	250%

OVERALL DISCOUNT: ☐ PERCENTAGE ☐ TIERED

VIEW ENHANCED ANALYSIS 0.000000 % DISCOUNT

TOTALS
DEALER COST
DEALER MARGIN

QUOTE TOTAL

OK CANCEL

162-164

INTERNATIONAL SEARCH REPORT

Int. .ional Application No

PCT/US 98/09890

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/50 G06T17/40 G06F17/60

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 111 392 A (MALIN STUART B) 5 May 1992 see abstract; claims 1-9 see column 3, line 1 - line 17 see column 1, line 52 - column 2, line 34 see column 3, line 39 - line 60; figure 4 see column 5, line 10 - line 33; figures 1,9 -----	1-40
X	US 5 293 479 A (SMITH JIM ET AL) 8 March 1994 see abstract see column 2, line 7 - line 44 see column 3, line 21 - line 28 see column 9, line 37 - column 10, line 15; figure 1 -----	1,13,14, 26,40

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

13 August 1998

Date of mailing of the international search report

20/08/1998

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Suendermann, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/09890

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5111392	A	05-05-1992	NONE	
US 5293479	A	08-03-1994	AU 2309792 A	11-02-1993
			CA 2112977 A	21-01-1993
			EP 0598748 A	01-06-1994
			WO 9301557 A	21-01-1993